SCIENTIFIC AMERICAN

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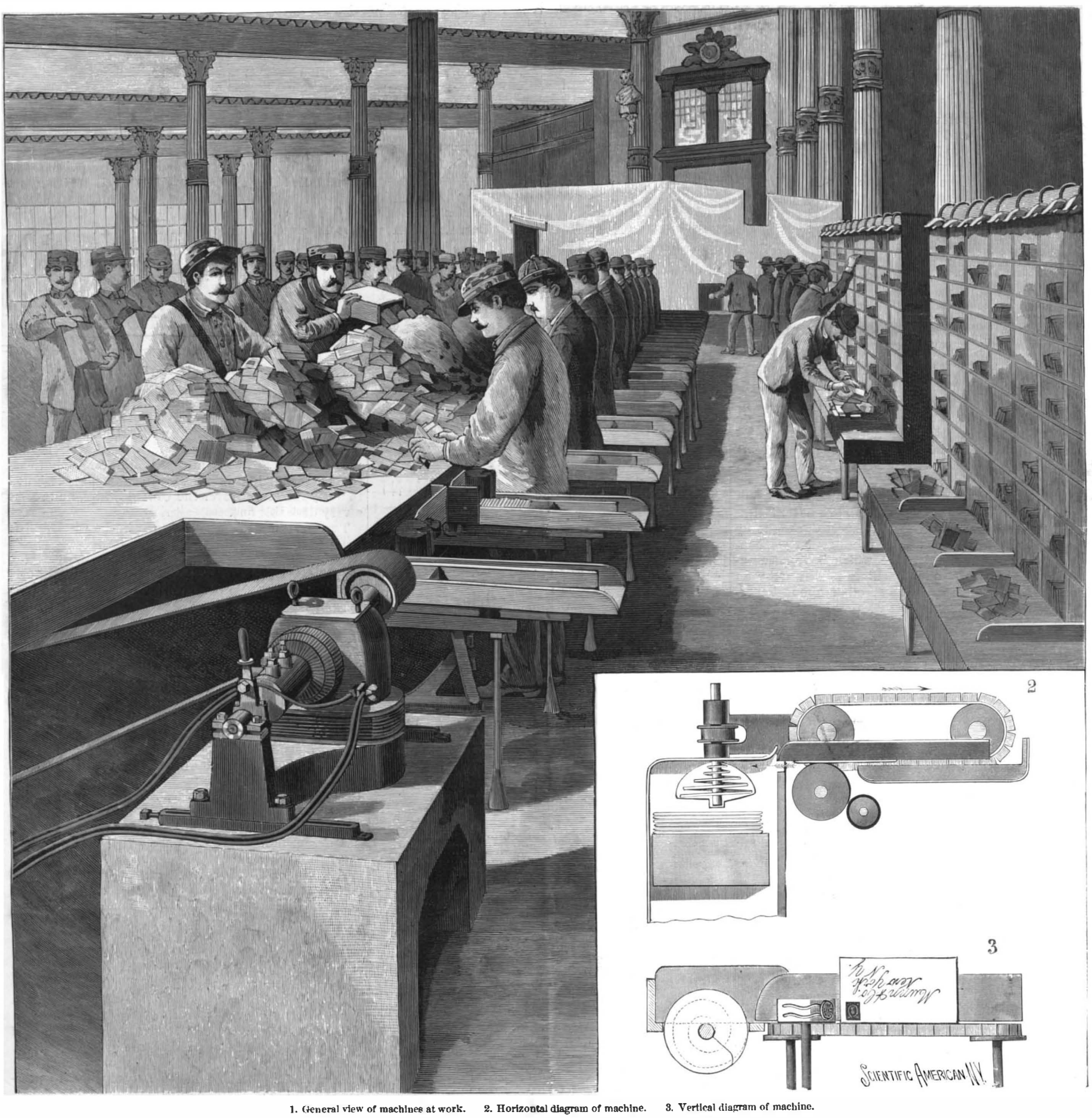
LETTER CANCELING MACHINES AT THE NEW YORK POST OFFICE.

The canceling of mail matter in such offices as the New York post office is a work bewildering in its immensity and the number of letters to be marked and stamped. Every letter that enters the office has to have impressed upon it a stamp giving the day, month, year and hour of its reception, and in addition thereto, if it is a New York letter, it has to have its stamp canceled or killed. Letters from the out-of-town post offices, as received in the New York office, already have their stamps killed and in addition thereto have stamped upon their faces the dating stamp of the country office from which they are received. These must receive the New York office dating stamp. Letters deposited in the post office or in the letter boxes are brought to the canceling table devoid of any cancelation mark to receive the imprint of the New York office. Those from the out-of-town offices have to have the stamp put upon their backs, and those deposited in the post office or in the letter boxes of the district have to have the stamp killed and the date put upon their faces. Formerly this was done by hand, and the clerks who did it acquired great skill, and it was interesting to watch the rapid motion of their arms and the disappearance of the accumulated letters under the automatonlike movements.

Many attempts have been made to invent machines to do this work, and about six years ago some success was attained in this direction. We illustrated, in a former article, the letter stamping machine then in use in the New York post office, one which gave very remarkable and exceedingly satisfactory results. This machine was known as the Hey & Dolphin machine. The American Postal Machine Company's machine and the Barry machine are now used, and the canceling of the great majority of letters, circulars and postal cards is done by machinery, the old hand stamps being used only for special work.

We illustrate in our cut a scene in the New York post office, where the American Postal Machine Company's machines, called colloquially the Boston machines, are working. A long table runs down the room, and along its edge are arranged a number of the canceling machines. The letter carriers and other



1. General view of machines at work. 2. Horizontal diagram of machine. 3. Vertical diagram of machine.

LETTER CANCELING MACHINES IN THE UNITED STATES POST OFFICE, NEW YORK CITY.

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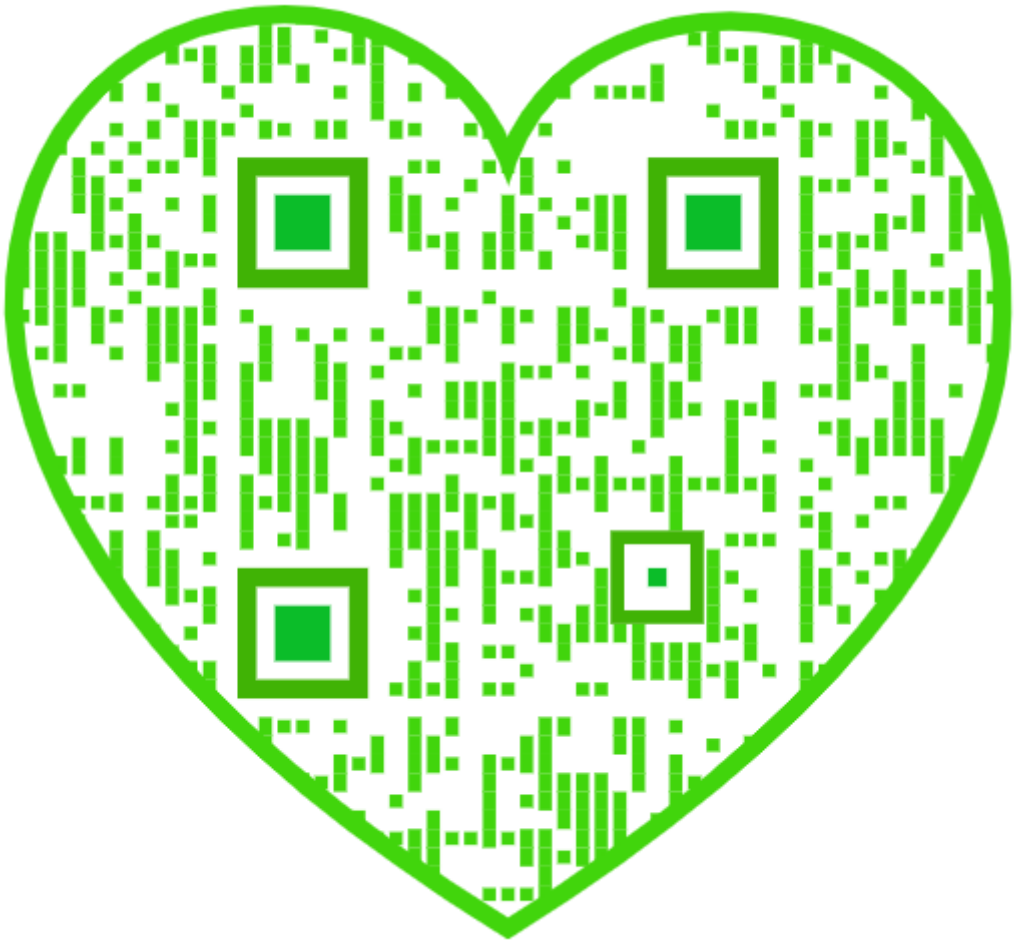

employes carrying bundles and sacks of letters come to the table on the side opposite the machines and throw down the letters, without any order, in great quantities. The carriers here have to sort over the letters and pick out and separate from them the letters for New York city delivery. Those for outgoing domestic delivery are left upon the table. The New York city letters are taken elsewhere for cancelation.

The long row of operatives, one for each machine, attack the piles of letters, pull the letters over toward them one by one, face them, and note whether the stamp is in the right place and then feed them one by one into the machine. If the stamp is not in the right place or side, the letter would have to be reversed on its entrance into the machine. This work is done with great rapidity, the piles of letters disappearing as if by magic. Ordinarily during the day time a man works the machine only from five to twenty minutes at a time, but during the "rush hours" as they are termed, from 4:30 to 8 in the afternoon and evening, the work at the machines is incessant, and for three hours they are never idle. The capacity of each machine is 5,000 per hour, this capacity being limited purely and entirely by the capacity for feeding, as, if a man were able to work fast enough, between three and four hundred a minute could be disposed of. With the old hand service 3,000 per hour was a good rate of work for a man.

The construction of the machine is simplicity itself, and our two views, Figs. 2 and 3, illustrate it. Fig. 2 shows the horizontal projection of the machine as one looks down upon it. A belt is seen traveling around two rollers in the direction of the arrow. The lower portion of this belt is provided with a series of little blocks of leather so as to form a sort of shelf. The letters are fed in one by one at the narrow opening seen to the right of the lead of the belt nearest the reader. Their lower edges rest upon the blocks of leather as on a moving shelf, and the belt rapidly carries them along. As they move forward they are pressed by the belt pulley against a roller, the left hand one, on whose face is carried the canceling device for killing the stamps, and the dating die. In contact with this roller an inking roller operates, which is also shown. The left hand belt pulley is held to its place by a spring bearing, so that it can yield backward for letters of varying thickness, and constantly presses them against the canceling roller. Reference to Fig. 3, which represents the vertical aspect of the machine, in connection with what we have said, will render all clear. There we see the letter resting on the little shelf with the slide back of it. To the left, almost in line with the left hand belt roller, is seen a canceling roller with its waving lines and dating stamp.

It is evident that as the letter travels toward the left this will press against it, cancel the stamp and date the letter also. The letter now moves forward to a table, and through the table a sort of Archimedes' screw projects, which will be seen to be of conical contour. The screw catches the letter with its smallest thread and screws it forward, getting a better and better hold as the letter progresses, and finally pushes it forward out of engagement. Letter after letter is thus treated, placed, carried through, canceled, caught by the screw and carried along, the new letters constantly pressing forward those which have accumulated. The entire row of machines is driven by an electric motor, which runs at a speed of about 520 revolutions a minute and drives the canceling machine at a rate of 350 revolutions per minute; each revolution is capable of canceling a letter were it possible to pass the letter so rapidly through the machine.

The familliar device of the waving American flag is employed in this machine, the waving lines of the flag being employed to prevent the wearing out of the inking roller, as straight lines would inevitably depress it into grooves.

The dating stamp, without taking the machine apart, can be removed, have its type changed and then be replaced, the whole affair being the work of a few seconds only. There are now at work in the New York post office some twenty of these machines.

There is another kind of canceling machine used in the same office, the Barry machine, built by the Barry Postal Supply Company, of Oswego, N. Y., of which there are six at work. If it has the letters fed to it in bulk and faced, it can dispose of 30,000 to 40,000 letters per hour. For regular sized mail, such as circulars, which are often delivered to the New York post office in great quantities already faced and with the stamps in the same position on all the envelopes, this machine is highly advantageous. The two kinds in one office form a combination of high efficiency.

Our thanks are due to Mr. Thomas J. Clarke, Superintendent of Mails, New York post office, for courtesies extended in connection with this article.

IT is said that one-tenth of the population of England suffer from gout. Dr. Fehlauer, a Berlin physician, attributes this to the excessive consumption of meat, and recommends a more restricted or vegetarian diet.

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PROPOSED PATENT LEGISLATION.

A very important bill, important in its list of authors as well as in its import, has been brought before Congress. It is the House of Representatives bill No. 3014, and provides for amendment of the existing patent statutes. In at least one of its provisions it makes a more radical change than has been seriously proposed for many years. The genesis of the bill is found in the meeting of the American Bar Association at Detroit, last autumn, where a committee of lawyers, including some of the most eminent counsel in patent cases, reported five general amendments. The abstract of their report, or text of the amendments which they proposed, may be found in the SCIENTIFIC AMERICAN of November 2, 1895, and the principal object of the bill we are considering is to put these amendments into force. It was introduced by Gen. William F. Draper, of Massachusetts. We will note seriatim the changes proposed.

Sections 4886 and 4920 of the patent statutes are amended so as to make one point a little more specific—namely, that knowledge or use by others in this country of the matter of his invention, before the date of invention thereof by the applicant, shall be a bar to the issuing to him of a patent. The same sections of the present law hold that patenting or publication in printed form abroad prior to the date of invention shall be a bar to patentability of the thing so patented or published. This is amended by introducing the additional restriction that patenting or publication abroad two years before the date of application, without reference to the date of invention, shall be a bar also. This is a restriction upon the inventor, and acts to inspire greater diligence.

Section 4894 is amended so that applicants for patents must prosecute their cases within six months of their date of application, thus doing away with the old two year period which has so often been abused rather than used by those who wished to obtain the quasi protection of a "patent applied for" before they were prepared to take out their final papers. By this amendment only six months are allowed to intervene between any action of the examiner and corresponding prosecution of the case by the applicant. It is also an amendment in the direction of inspiring diligence on the part of the inventor.

Section 4898 is amended to provide for proper acknowledgment of an assignment, grant, or conveyance of patent rights, so as to make them constitute a prima facie evidence of the execution of the instrument. This amendment is rather of the technical order and is valuable.

Section 4921 is amended to fix the limit of time to be covered by an accounting in infringement suits to six years, and harmonizes the practice in the different States. This is in sequence of the decision by the United States Supreme Court in the case of Campbell vs. City of Hartford, rendered January 7, 1895, and commented on in our issue of January 26, 1895. In that decision it was held that State statutes of limitation apply to accountings in patent suits. The amendment is designed to unify the law all over the United States, and seems a very desirable one.

The most important amendment in the whole bill is found in section 4887, which is very far reaching in its consequences. We give herewith the amended section in full:

"Section 4887. No person otherwise entitled thereto shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid, by reason of its having been first patented or caused to be patented by the inventor or his legal representatives or assigns in a foreign country, unless the application for said foreign patent was filed more than seven months prior to the filing of the application in this country, in which case, no patent shall be granted in this country. This section, as hereby amended, shall not apply to any patent in this country granted prior to the passage of this act, nor to any applications for a patent in this country then pending, nor to any patent granted on such a pending application."

The object of this amendment is to do away with the present practice, which makes the United States patent expire at the same time as a foreign patent for the same invention, bearing an earlier date. This feature of our practice is very objectionable, and followed the decision in the case of Bate Refrigerating Company vs. Sulzberger et al., Edison Electric Light Co. vs. U. S. Electric Light Co., and other recent decisions, which declared the United States patents involved to have expired prematurely, owing to the expiration of a foreign patent of prior date. These decisions have sometimes cut off several years from the natural term of the United States patent.

The United States patent is dated from the day of *issue*, while the foreign patents are generally dated from the date of *filing*, and the American inventor according to the present practice is compelled to postpone the filing of his foreign patents until his United States patent is allowed and ready to issue. The proposed amendment is intended to enable him to file his foreign patents without awaiting the result of the pro-

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secution here, if he so desires. Under the present practice, his case may be pending in the Patent Office for several years, and the alternative is left to him either of running the chance of being anticipated in the meantime by some application in a foreign country or of having the term of his United States patent curtailed, owing to the earlier date borne by his foreign patents.

It is felt by those who have at heart the interests of the American inventor, and the patent system of the country, that the United States patent should stand as far as possible independent of the date or fate of any foreign patent for the same thing. The amendment proposed will no doubt afford this relief. There is unfortunately one feature of this section which cannot be accepted with the same feeling of approval. A foreign inventor is compelled, in order to fully protect his interests, to file his application in the United States within seven months of the date of filing his foreign patent. The term of seven months has evidently been suggested to the framers of this bill by the like term fixed by the International Convention.

It is a notorious fact, however, known to all attorneys having an extensive foreign patent practice, that the seven months term is entirely inadequate as far as the American inventor is concerned, and that he is able rarely to avail himself of its privileges. Fortunately for him, however, it is left optional with him either to file under the Convention or not, for he can still file his foreign applications, provided his United States patent was not yet issued. It seems unfortunate therefore that a term as short as seven months from the date of filing the application should have been selected.

The issuing of the patent abroad, in most cases, cannot be controlled as it can here, and the inventor has in many countries no intimation when the patent will issue. In Great Britain another problem presents itself, for the applicant may at his option file a provisional application. He is allowed nine months in which to file his complete papers, but the term of seven months has begun to run from the date of filing his provisional papers, and he has perhaps not yet completed his case.

It would seem, therefore, in view of these facts, that the section should read, "unless the application for said foreign patent was *issued* (*or sealed*) more than seven months prior to the filing of the application in this country." We think that such an amendment to the act would be in keeping with the broad spirit which has always animated our patent laws and practice, a policy which every one interested in the industrial and commercial development of this country wishes to see preserved.

Americans Win Olympian Laurels.

The 776th Olympiad began on April 6, and, for the first time since they were abolished, fifteen centuries ago, the famous games were revived—games, however, in which our modern cosmopolitan spirit is apparent by the lists being thrown open to the athletes of the world. The games were not held at the old Olympia, a small plain in Elis, but in the Stadium of Athens, an engraving of the interesting restoration of which was given in the SCIENTIFIC AMERICAN for January 11, 1896. The spectators flocked early to the Stadium, and soon 40 000 spectators, ncluding the King of Greece, the Duke of Sparta, and the Crown Prince, had assembled in the vast inclosure, while the surrounding hills were filled with spectators.

According to Dr. Marquand, Phayllus is said to have thrown the discus 95 feet. In the games at Athens, two Americans entered the arena to throw the discus —Captain Robert Garrett, of Princeton University, and Ellery H. Clark, of Harvard. Garrett threw the discus 29 15 meters (95·6 feet), defeating the Greek champion, Paraskevopoulos, by 19 centimeters (7½ inches). When it is considered that the Americans had little practice after their long voyage, and that Garrett was a novice at discus throwing—a game which has no modern counterpart, save, perhaps, the well known game of quoits—the wonderful versatility of the American athlete is apparent, and it is little wonder that, when the news of his victory was cabled to the United States, the halls of old Nassau rang with cheers.

The first heat of the 100 meter race was also won by a Princeton man, F. W. Lane, in 12⅕ seconds. The second heat was won by T. P. Curtis, of the Boston Athletic Association, in the same time. The third heat was run by T. E. Burke, of the Boston Athletic Association, in 11⅘ seconds. In the hop, step and jump, Connolly, of the Suffolk Athletic Club, Boston, covered 13 7/10 meters (44·9 feet). In the first heat of the 400 meter race H. B. Jamison, of Princeton, was first. The second heat was won by Burne, an Englishman.

On the second day of the games it is estimated that there were 100,000 spectators; the weather was perfect and the athletes were more accustomed to their surroundings. The first heat of the 110 meter hurdle race was won by Goulding, an Englishman. His time was 18⅘ seconds. The long jump was won by Ellery H. Clark, of the Boston Athletic Association, who covered 6·35 meters (20·8 feet). Robert Garrett, captain of the Princeton team, was second, with 6 meters (19·6 feet) to his credit. The 400 meter race on the flat was won by Thomas E. Burke, of the Boston Athletic Association. His time was 54⅕ seconds. H. B. Jamison, of Princeton University, was second. The next event on the programme was putting the weight. Capt. Garrett won, scoring 11·22 meters (36·8 feet).

In the evening the Acropolis and city were illuminated with myriads of lights. On April 8 occurred the shooting contest. The bicycle race at a distance of one hundred kilometers (62 miles) was won by Flamant, the French rider. The winner's time was 3 hours and 8 minutes.

On April 9 the weather was extremely cold, and the events consisted of shooting contests, saber contests and the 800 meter race. In the long distance foot race over the historic course from Marathon to Athens (26·1 miles), on April 10 the first three to cross the finish line were Greeks. The time of the winner was 2:48:00.

The 100 meter race was won by Thomas E. Burke, of Boston, in 0:12.

The high jump was won by Ellery H. Clark, of Harvard, who covered 181 centimeters (5·9 feet).

The hurdle race of 110 meters was won by Thomas P. Curtis, in 0:17⅘.

The pole jump was won by W. W. Hoyt, of Harvard, who scored 3·30 meters (10·8 feet). The Payne brothers, Americans, won the rifle and revolver contests. In the high jump, James B. Connolly and Robert Garrett each scored 1·65 meters (5·4 feet).

Cheap Gas for Heat and Power Purposes.

There is as keen a competition among the various industries which aim to supply a common want as there is among the men who create and carry them on; and it is as healthy and stimulating in its effect upon the industry as it is upon the individual. The possibility of supplying cheap gas to the people is one of the live questions of the day; and it has largely sprung out of the competition between the great gas and electrical industries. Additional prominence has been given it of late by the rapidly increasing use of the gas engine, and by improvements in its design which have brought it to the very front rank as a handy and economical source of power. The first introduction of the electric light created quite a panic among the gas companies. Most of us can remember the feverish activity with which they set about the improvement of gas apparatus, and how all at once the sickly glimmer of the common street lamp gave place to a flood of illumination, softer than the arc light, and in many cases of equal volume. Gas manufacturers were shaken out of their apathy, and not only improved the light, but began to figure on reducing its price. Unfortunately, the awakening was temporary —at least in the United States. When it was found that the cost of electric lighting would be much greater than its promoters had originally claimed, so much greater, indeed, that for domestic purposes it was incapable of successful competition, the gas companies settled down into the old rut, and were content to continue selling their gas at very large profits to a limited number of consumers. We use the terms "large" and "limited" in a relative sense, using as a standard of comparison the price and the consumption of gas in some European cities. The statistics of the principal gas undertakings of Great Britain for the year 1893 show that the consumption of gas per capita in that country, as compared with the United States, was surprisingly large, and the price remarkably low. Manchester, for instance, with the same population as Boston, sold her gas in 1893 for 60 cents per 1,000 feet.

As the result of this low price she sold 3,636,000,000 feet of gas, or more than the total amount furnished by the whole State of Massachusetts!

The cause of this wide difference is found in the fact that in Massachusetts gas costs on an average $1.50 per thousand, as against 60 cents in Manchester. These figures, startling as they are, are perfectly consistent with the economic law that, other things being equal, the consumption of a commodity in two different localities will vary in the inverse ratio of its price.

The above quoted figures are taken from the recent testimony of Mr. Henry M. Whitney, before the Legislative Committee on Manufactures, in regard to a proposal to furnish the city of Boston with cheap gas and coke. Whatever may be the merits or demerits of Mr. Whitney's proposal, the testimony itself is of such a high technical and scientific character, and the review of the present state of the gas and coke industry in this and other countries is so replete with up-to-date description of processes, and statistics of price and consumption, that it is worthy of a wider hearing than is possible within the hall of a legislative assembly. We have prepared a digest of the address, which will be found in the current number of the SUPPLEMENT.

The question of cheap gas, not merely for lighting, but for heat and power purposes, is of vital importance to the laboring classes of this country; for a family which cannot afford to use gas at say $1.69 a thousand, which is the price in East Boston, would gladly avail itself of gas at 69 cents per thousand, which is 9 cents more than the price in Manchester and 29 cents more than the people pay in Newcastle-on-Tyne, where they get it for 40 cents a thousand.

For domestic cooking there is no apparatus so clean and economical as the gas range, and for economy it is vastly superior to the coal fire, which, from the time it is lit for cooking to the time it dies out, consumes many times the amount of heat that is actually necessary to cook the meal.

Mr. Edward Atkinson, one of our most famous statisticians, has found as the result of careful experiment with a cooking range using coal that it took two pounds of coal to cook one pound of food, and he says: "I did not dare to rely on these empirical observations until they were more than sustained by Prof. Ferguson, of Lehigh University." Mr. Atkinson estimates that the average cost of the fuel used for cooking purposes, pure and simple, in a family is about $12.50 a year. Experiment showed that the same amount of cooking could be done by 3,600 feet of gas, which, at say 50 cents a thousand, would come to less than $2 a year; a saving to the family of more than $10 50 a year. This in itself would be no small saving to the laboring man; but of even greater importance would be the saving in time and labor and the greater cleanliness resulting from the absence of dust and ashes. That the people do not use gas because the price is prohibitive is shown by the statistics of Lowell, Mass., and Quincy, Mass. In Lowell, where gas is sold at $1.06 per thousand, there is one meter to every two families; but in Quincy, where the price is $2.12 per thousand, there is only one meter to every ten families. From these figures we are warranted in concluding that a reduction in the price of gas would be at once an enormous boon to the working classes, and, as a result of the greatly increased consumption, a positive gain to the manufacturers.

Of scarcely less importance is the question of the increased consumption of gas resulting from its extended use in gas engines. For some reason or other the gas engine has not received the attention in the United States that it has in England. No doubt the price of gas here has been prohibitory; and the greater attention that has been paid in this country to the development of the electric motor has caused the gas engine to be neglected.

It is stated that there are many European manufacturers who will furnish gas engines, guaranteed to run on 17 cubic feet of gas per horse power per hour; and Mr. Westinghouse, in this country, is building engines which he will guarantee to use 20 cubic feet per horse power hour. If gas could be supplied at the Manchester price (60 cents a thousand), such an engine would cost twelve cents per horse power per day for a day of ten hours. If the figures of Mr. Westinghouse's guarantee can be realized in practice, and if there are no local conditions which make it impossible to manufacture gas in the United States at something less than $1 per thousand feet, there should be a great future for the gas engine in this country.

Properties Lost on Railways.

In the English Strand Magazine Mr. W. Fitzgerald tells of the Lost Property office in London. He visited Scotland Yard, and the lost property rooms of most of the railway companies. He began with Euston, where about 30,000 articles are received every year. About three-fourths of the larger ones are restored to their owners, but there are more than twenty inquiries every day about articles which have been lost and not found. Four thousand unclaimed umbrellas are sold every year. A first class passenger from Liverpool to Euston had thrown his artificial teeth out of the window with some plum stones. The line was searched, and the teeth were found, and duly restored to their owner. At King's Cross it takes six weeks to sort up the articles for the annual sale. The Great Northern sells two tons of newspapers every twelve months. Umbrellas are sold in lots from six to thirty-six, and fetch from $10 a lot downward. All the lost property found in the Great Northern last year unclaimed was sold for $850. As 1,000 walking sticks and 1,300 umbrellas were included, the articles must have been sold dirt cheap.

The Great Eastern railway company last year sold the following articles among the unclaimed lost property: "One hundred and forty handbags turned up, and there were five huge cases of books; 459 pairs of boots and shoes; 614 collars, cuffs and fronts; 252 caps; 505 deerstalker hats; 2,000 single gloves; 230 ladies' hats and bonnets; 94 brushes and combs; 265 pipes; 110 purses; 100 tobacco pouches; 1,006 walking sticks; 300 socks and stockings; 108 towels; 172 handkerchiefs; 2,301 umbrellas and 7 big cases and 128 separate articles of wearing apparel."

There are any number of gloves which are sold very cheap. At the last sale 2,000 gloves went for about 2 cents a pair. At the London and Southwestern line last year the lost property included 103 mackintoshes and 340 hats and caps. The purses found in the trains at the Southwestern yield on an average $500 a year.

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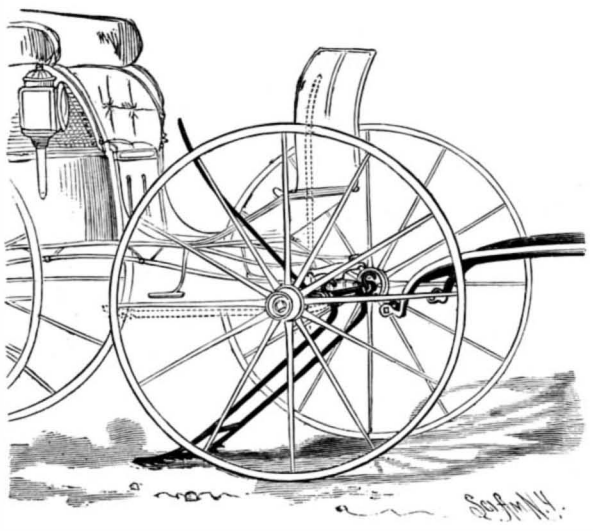
A HORSE DETACHER AND BRAKE.

To release a runaway horse from a vehicle and almost immediately stop the vehicle at the same time, by the movement of a single lever, the improvement shown in the accompanying illustration has been patented by Joseph Friedlander, of No. 219 West Commerce Street, San Antonio, Texas. The invention is an improvement on a formerly patented invention of the same inventor, illustrated in the SCIENTIFIC AMERICAN of February 15. On the front of the forward axle, bearings or boxes are secured by means of clips, a shaft journaled in these bearings having one end carried upward to form a lever or handle, which is held normally in vertical position by a spring connecting the shaft and the axle. Attached to the axle by means of clips, inside of each of the bearings, is a keeper plate having an opening adapted to receive a hook integral with or secured to the shaft, and between the hooks a brake is secured to the shaft, the brake preferably consisting of two rearwardly extending bars, each terminating at its outer end in a shoe with roughened under face. When the shaft is in normal position the bars of the brake extend horizontally under the vehicle, the handle lever then being in vertical position, as indicated by the dotted lines. At the rear end of each thill iron is journaled a roller, which, when placed on a keeper plate, is adapted to be engaged by one of the hooks on the shaft, the hooks being raised out of their openings in the plate by moving the handle lever backward, and the spring turning the shaft and moving the hooks to engagement with the thill irons when the lever is released. To release from the vehicle an unruly horse, the lever is moved backward, as shown in full lines in the illustration, the hooks being thereby raised and releasing the thills, while at the same time the arms of the brake lever are carried downward, so that their shoes will engage with the ground.



FRIEDLANDER'S HORSE DETACHER AND BRAKE.

COMBINED GAS ENGINE AND CENTRIFUGAL PUMP.

A combined gas engine and centrifugal pump recently supplied by Messrs. Crossley Brothers, of Openshaw, Manchester, to the River Wear Commissioners, at Sunderland, is illustrated by the engraving below. Three of these engines and pumps are used for emptying the No. II graving dock belonging to the commissioners.

Some time ago, when the question of pumping plant was under consideration, Mr. H. H. Wake, M. Inst. C.E., the engineer to the commission, decided on adopting gas engines instead of steam, and after having thought over the different means of driving the pumps, resolved on having them coupled direct to the engine crank shaft. By this means a much smaller engine house is needed than would be the case if the pumps were driven by means of belts, and the loss due to slip and trouble in taking up the slack are avoided.

The engines are of 40 nominal horse power, and are capable of giving off 120 brake horse power when running at 210 revolutions per minute. They are of Messrs. Crossley's well-known type, but only one fly wheel is keyed on the engine crank shaft, the other being carried on the outer end of the pump shaft, kept large in diameter for the purpose. A very strong flange coupling is forged on the inner ends of the engine and pump shafts; and they are bolted together by means of steel taper bolts.

The sole plates of the engine and pump are bolted together, thus making a strong and selfcontained job. The centrifugal pumps are 22 in. in diameter, and have been specially designed to meet the circumstances of the case. Each engine and pump is capable of lifting 2,380 tons of water per hour 24 ft. high.

The speed of the engine and pump can be regulated at pleasure to suit the varying head against which the water is delivered, by means of an adjusting screw on the engine governor; and at a recent trial it was found that when only running at 180 revolutions per minute the pumps emptied the dock in much less than the specified time. We hope shortly to publish full particulars of the test.

The engines work with coal gas from the street mains, and can be started at a moment's notice. Undoubtedly gas engines have many advantages over steam for this class of work, as preliminary expenses in getting up steam are avoided, the motive power being always ready, and consumption of fuel ceases as soon as the dock is emptied. We are indebted to the London Engineer for the cut and copy.

Why Latin is Used.

The New York Herald publishes the following reply to the query why doctors use Latin in writing their prescriptions instead of English.

In the first place, Latin is a more exact and concise language than English, and, being a dead language, does not change, as all living languages do.

Then, again, since a very large part of all drugs in use are botanical, they have in the pharmacopœia the same names that they have in botany—the scientific names. Two-thirds of such drugs haven't any English names, and so couldn't be written in English.

But suppose a doctor did write a prescription in English for an uneducated patient. The patient reads it, thinks he remembers it, and so tries to get it filled from memory the second time. Suppose, for instance, it called for iodide of potassium, and he got it confused with cyanide of potassium. He could safely take a number of grains of the first, but one grain of the second would kill him.

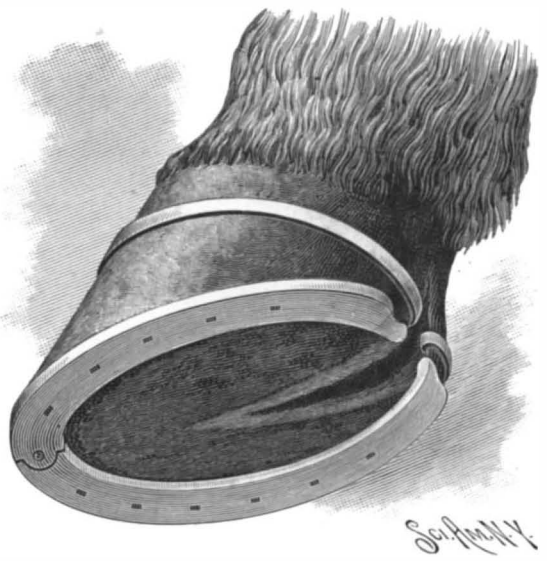
That's an extreme case, but it will serve for an illustration. Don't you see how the Latin is a protection and a safeguard to the patient? Prescriptions in Latin he can't read, and consequently does not try to remember.

Now for a final reason. Latin is a language that is used by scientific men the world over, and no other language is. You can get a Latin prescription filled in any country on the face of the earth where there is a drug store.

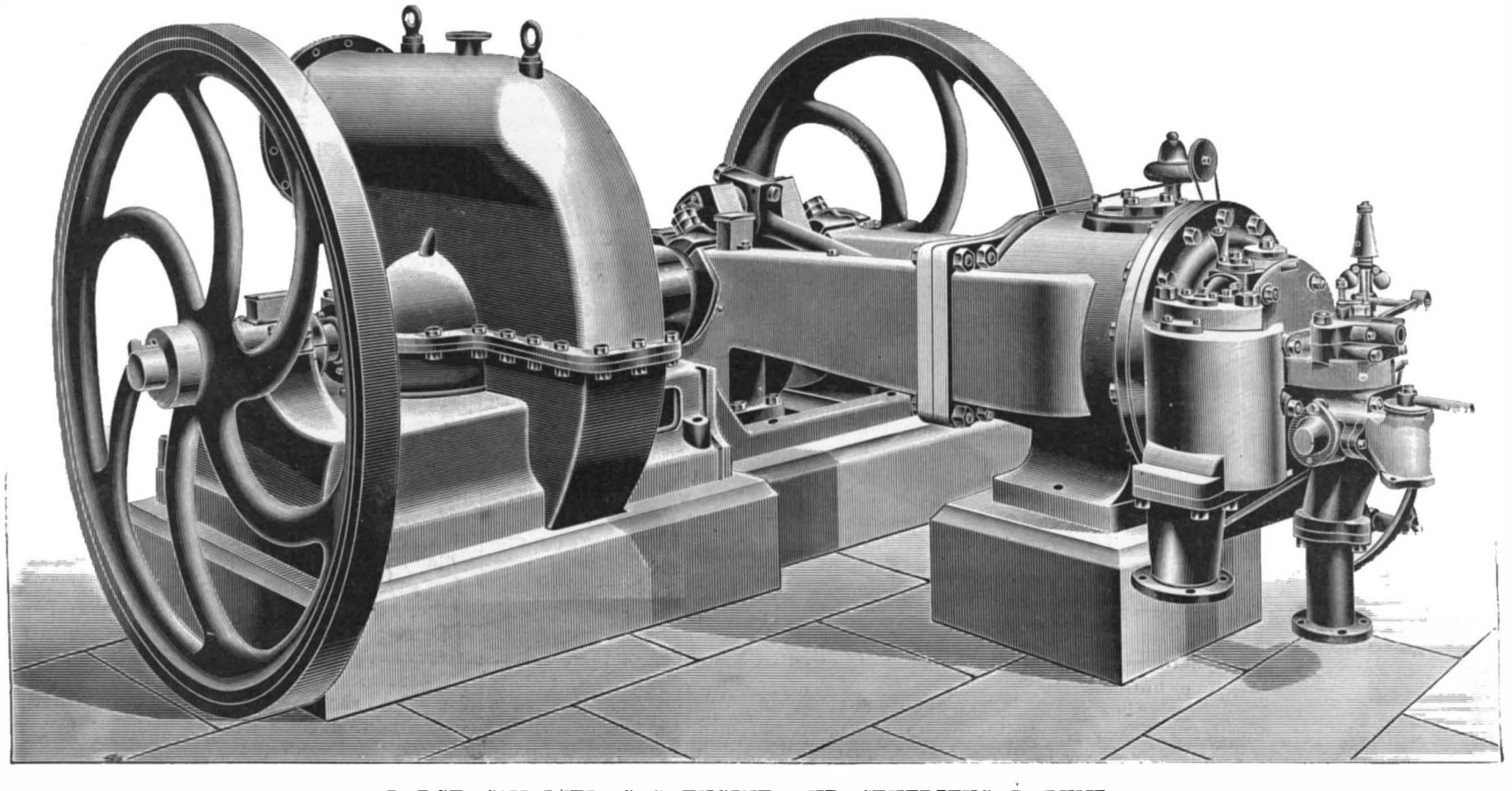
We had a prescription here the other day which we had put up originally, and which had since been stamped by druggists in London, Paris, Berlin, Constantinople, Cairo, and Calcutta. What good would an English prescription be in St. Petersburg?

A HOOF SPREADING DEVICE.

For spreading the hoofs of horses or mules, to prevent and cure lameness, the simple and inexpensive device shown in the accompanying illustration has been invented and patented by Jacob Trenkle, of Portville, N. Y. It consists of a metal yoke piece bent to conform to the contour of the hoof on which it is to be applied, and having at each end an inwardly bent hook member adapted to engage the rear ends of the coronary band on the hoof of the animal. The yoke piece is preferably of thin steel, and when in position inclines upwardly and forwardly, encircling the hoof and fitting closely thereon. The device is preferably employed in connection with a light shoe formed of two pieces jointed at their forward ends, the shoe also having at its rear ends hook-shaped lips which engage the coronary band. When it is desired to spread one-quarter of the hoof only, the joint of the shoe is placed at one side of the toe, instead of centrally, and one hook member of the yoke piece is made to engage with a notch in the shoe instead of with the coronary band, the full force of the expansive spring then being exerted to spread the hoof on the other side. The moderate pressure constantly applied in this way is adapted to gradually effect the desired divergence of the parts, relieving sensitive portions and promoting a better circulation.



TRENKLE'S HOOF SPREADER.



LARGE COMBINED GAS ENGINE AND CENTRIFUGAL PUMP.

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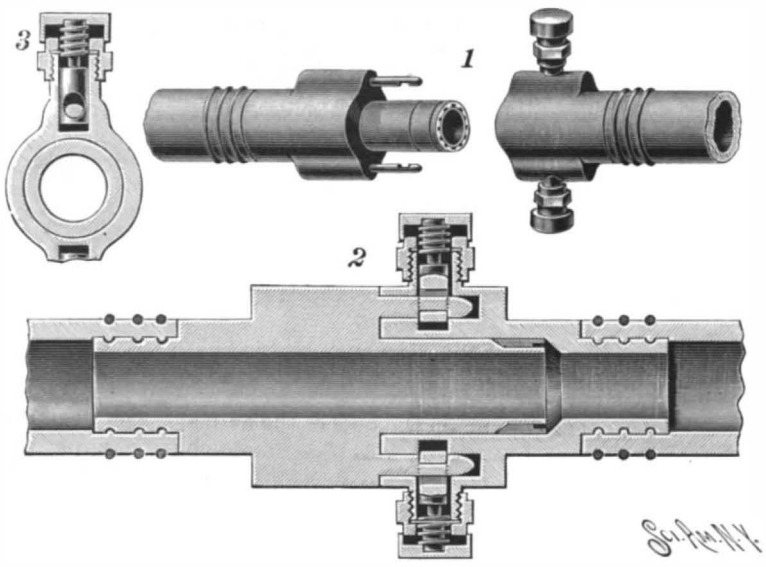
AN AUTOMATIC HOSE COUPLING.

The illustration represents a hose coupling by means of which the sections of hose are automatically locked when brought together, the coupling being readily and conveniently effected even while the pressure remains on the hose. The device may also be used with a nozzle, enabling the hose to be broken at any joint and the nozzle put on as quickly as a coupling would ordinarily be effected. The improvement has been patented by Thomas A. Oothouse and Albert E. Bohlen, of Mount Olive, Ill. Fig. 1 is an exterior view of two sections of the coupling uncoupled, Fig. 2 being a sectional view of the parts coupled, and Fig. 3 being a transverse section. In an offset at each side of the head of the female coupler section is a longitudinal bore and annular chamber, each chamber being extended through the offset and having an exteriorly threaded thimble. Sliding in each chamber is a spring-pressed latch, and the outer end of each latch shank is provided with a cap, the springs normally carrying the bottom portions of the latches outward to position to interrupt the bore. The male section of the coupling has a central tubular tongue adapted to enter the body of the female section, and projecting studs adapted to enter the longitudinal bores in the sides of the offset, there being in the studs latch-receiving recesses which engage with the spring-pressed latches when the parts are moved into engagement, thus securely locking the two sections together. To effect an uncoupling, it is only necessary to press inward upon the two caps, by which the latches are released from engagement with the studs. To prevent the caps being unintentionally pressed inward, a nut is screwed outward on the exteriorly threaded thimble to engage with each cap.



OOTHOUSE AND BOHLEN'S HOSE COUPLING.

Queen Victoria's Real Estate.

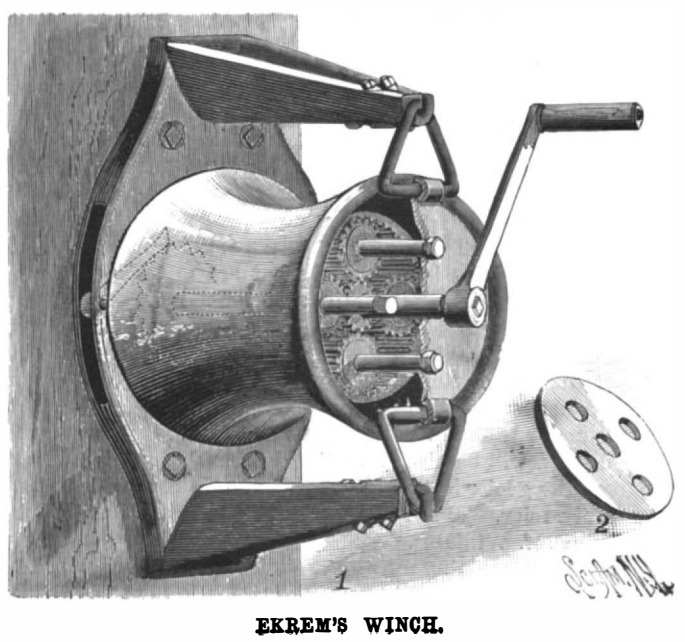
The announcement that Queen Victoria is to leave, by will, Osborne House to one daughter, the lease of Abergeldie House to another, and Balmoral, the royal residence in the Highlands, to the Duke of Connaught, recalls the fact that the man who would devour this particular widow's houses must make an uncommonly full meal. It was discovered a few years since that the Queen owned six hundred houses in various parts of England, not royal residences, but rent-yielding property, and that about six thousand houses had been built by crown lessees on building leaseholds held of the Queen. She then had also rents from markets and tolls from ferries, besides the proceeds of mines and other works upon her property or the crown property. She had large estates in Yorkshire, Oxfordshire, and Berks. valuable lands in the Isle of Man and in Alderney, Scotland, Ireland and Wales. Of the New Forest there are two thousand acres of absolute and sixty-three acres of contingent crown property. Her Majesty enjoys income from the Forest of Dean, from several other forests, and from rich properties in and about London. Osborne, on the Isle of Wight, and Balmoral, in the Highlands, are the private property of the Queen, and are maintained out of her own income. But she has the use of a few royal palaces besides, and these are maintained by the nation at an annnal expenditure ranging from $2,500 to $50,000. The Queen is in the occupancy of Buckingham Palace. Windsor Castle, the White Lodge at Richmond Park, and part of St. James's Palace. The remainder of the last named palace is occupied by other members of the royal family. Other royal palaces maintained as such, although not in the occupancy of the Queen, are Kensington Palace, Hampton Court—which, according to a recent estimate based on the statistics of eight or ten years, costs the nation on the average over $70,000 a year--Kew Palace, Pembroke Lodge, the Thatched Cottage and Sheen Cottage, Richmond Park, Bushy House in Bushy Park, and Holyrood Palace. When she visits the Continent, she has one great house or another, with whatever repairs and refurnishing are necessary to fit it for a temporary royal occupant, although for all this she pays out of her own income. Bagshot House, Gloucester House and Clarence House are palatial dwellings, occupied by various members of the royal family. The Queen has four rather old-fashioned yachts, on which she makes her sea journeys, although the oldest of them probably is used seldom or never. The four cost originally about $1,375,000.—Boston Transcript.

Longevity and Activity.

Great men usually carry their full mental vigor and activity into old age. M. Chevreul, M. De Lesseps, Gladstone and Bismarck are evidences of this anthropological fact. Pius IX, although living in tempestuous times, reached a great age in full possession of all his faculties, and the dramatist Crebillon composed his last dramatic piece at 94, while Michel Angelo was still composing his great canvases at 98, and Titian at 90 still painted with all the vigor of his earlier years. The Austrian General Melas was still in the saddle and active at 89, and would have probably won Marengo but for the inopportune arrival of Desaix. The Venetian Doge Henry Dandolo, born at the beginning of the eleventh century, who lost his eyesight when a young man while on an embassy to Constantinople, through the treachery of the Greek Emperor Manuel, was nevertheless subsequently raised to the highest office in the republic, managed successfully to conduct various wars, and at the advanced age of 83, in alliance with the French, besieged and captured Constantinople. Fontenelle was as gay-spirited at 98 as in his fortieth year, and the philosopher Newton worked away at his tasks at the age of 83 with the same ardor that animated his physical prime. Cornaro was as happy at 90 as at 50, and in far better health at the age of 95 than he had enjoyed at 30. These cases all tend to show the value and benefits to be derived from an actively cultivated brain in making a long life one of comfort and of usefulness to its owner. The brain and spirits need never grow old, even if our bodies will insist on getting rickety and in falling by the wayside, but an abstemious life will even drag that old body along to centenarian limits in a tolerable state of preservation and usefulness. The foregoing list can be lengthened out with an indefinite number of names, but it is sufficiently long to show what good spirits and an active brain will do to lighten up the weight of old age. When we contemplate the Doge Dandolo at 83 animating his troops from the deck of his galley, and the brave old blind King of Bohemia falling in the thickest of the fray at Crecy, it would seem as if there was no excuse for either physical, mental or moral decrepitude short of the age of fourscore and ten.—National Popular Review.

AN IMPROVED WINCH.

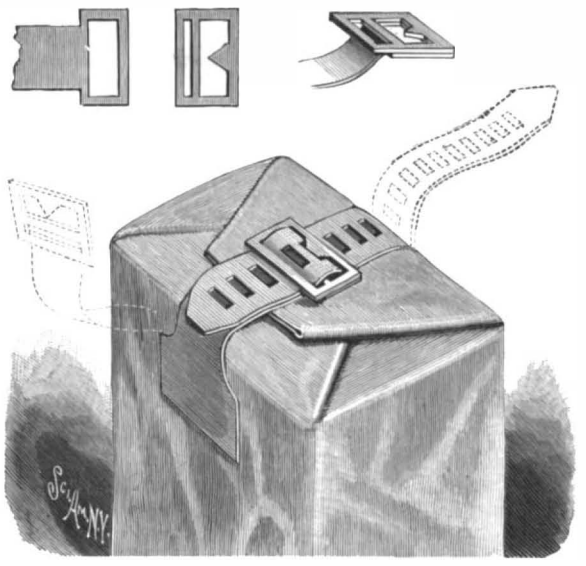
The illustration represents a winch which may be placed and operated in any position, and especially designed for use on shipboard in hauling braces, halyards, etc., as it may be attached to the railing, bulwark or mast, or other convenient support. In the back plate is a central interior chamber, and on its front face are top and bottom horizontal arms in whose outer ends are bolt cavities, the outer ends of the bolts being bent to form hook arms. The drum or barrel is toothed centrally on its inner surface, and around the central shaft, journaled in the back plate, are four stationary shafts, screwed or otherwise firmly secured at their rear ends in the back plate. On these shafts are collars at the rear side of the teeth on the central inner surface of the drum, and on the collars rests a rear guide plate having openings to receive all the shafts, as shown in Fig. 2, there being a similar front guide plate, and adjustable sleeves being fitted to all the shafts to engage the outer face of the forward guide plate. The central shaft has a pinion adapted to engage pinions loosely mounted on the stationary shafts, the latter pinions engaging the teeth on the inner face of the drum, to impart a rotary motion thereto. The improvement has been patented by Harry Ekrem, of San Pedro, Cal. The guide plates, with the collars and sleeves, prevent end movement of the shafts, and the front plate is held in position by top and bottom yokes or links, the plate being readily removable by turning the hook ends of the bolts. The central shaft is prevented from unwinding by a ratchet wheel engaged by a gravity pawl in the chamber in the back plate, as indicated by the dotted lines. This winch may be readily taken apart and put together, and is designed to enable one man to develop great power in pulling on a rope, chain or cable.



EKREM'S WINCH.

AN IMPROVED BAG TIE.

The illustration represents a tie especially adapted for use in connection with paper bags, and consisting of two straps, each designed to be secured to the bag, one of the straps carrying a peculiarly constructed buckle with which the other strap locks. A patent has been granted for this improvement to Walter P. Scofield, of Cedar Key, Fla. One of the straps has an opening in its enlarged free end, where a buckle is attached having two transverse openings, as shown in the small views, the buckle being preferably secured by gluing where the device is used on paper bags. Projecting into one of the transverse openings of the buckle is a tongue adapted to engage one of several slots in the other strap, thus locking the bag, as shown in full lines in the large view, the dotted lines indicating the position of the straps before they are locked together to tie the bag.



SCOFIELD'S BAG TIE.

Speed of Atlantic Passenger Ships.

Following is a list of the principal Atlantic passenger ships, with their best average time on voyages during 1895:

Name of steamer.	Best average time in knots.	Name of steamer.	Best average time in knots.
Lucania	22·01	St. Paul	19·45
Campania	21·82	St. Louis	19·56
Teutonic	20·35	Columbia	19·18
Majestic	20·41	Paris	19·87
Etruria	19·67	Augusta Victoria	18·40
Umbria	19·56	Havel	18·78
Germanic	16·94	Lahn	18·36
Servia	16·80	Spree	18·65
Aurania	17·00	Aller	17·74
Britannic	16·00	Trave	17·46
Fuerst Bismarck	20·14	Ems	17·01
New York	20·26	Saale	17·46
Normannia	20·23	Fulda	16·66

—Marine Review.

Not a Bad Idea.

A gentleman once asked a lawyer what he would do provided he had loaned a man $500, and the man had left the country without sending any acknowledgment.

"Why, that's simple; just write him to send an acknowledgment for the $5,000 you lent him, and he will doubtless reply stating it was only $500. That will suffice for a receipt and you can proceed against him if necessary."

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Science Notes.

The Franklin Institute proposes to award the John Scott legacy medal and premium to the following parties for meritorious discoveries and inventions: To Lieut. George O. Squier and Albert C. Crehore, for their polarizing photo-chronograph; Joseph Richards, for his solder for aluminum; A. L. Johnston, for his bonding joint for electric railways.

MM. D'Arsonval and Charlan have proved by experiments that currents of high frequency attenuate the bacterial toxines. Toxines thus attenuated increase the resistance to infection of animals into which they have been injected.

Sir W. M. Conway proposes to take a party to Spitzbergen, in the summer of 1896, for the purpose of exploring the interior. He expects to be accompanied by several scientific experts, so that the journey promises to be very important from a scientific point of view. The island is penetrated with fjords and no part is very far from the sea. The explorers will therefore cross from fjord to fjord.

Prof. Alexander Agassiz has determined to undertake an expedition, the object of which is to investigate the many subjects connected with the great barrier reef of Australia. He will be accompanied by a trained staff of artists and assistants, and Mr. W. Ward, an experienced collector, will also go with him.

The New England Association of Opticians are raising funds to build a memorial to be erected to Robert B. Tolles, who lies buried at Mount Auburn, Cambridge, Mass. In their opinion, a man so honored as an optician deserves some remembrance.

M. Henri Moissan has produced carbide of uranium, and says that when formed with excess of carbon in the electric furnace the carbide is a definite and crystallized one, corresponding to the formula U_2C_3 (U=240). Cold water decomposes it, a third of the carbon being given off in the form of a mixture of gaseous hydrocarbons, of which three-quarters are methane and very little acetylene. Hydrogen is also present. The remainder of the carbon produces a mixture of liquid and solid carbides. It looks as though this reaction might prove a typical one for the carbides of several elements, says the Electrical Engineer.

Investigations made by Dr. Carl Müller, and reported in Himmel und Erde, show that lightning prefers to strike certain kinds of trees. Under the direction of the Lippe-Detmold Department of Forestry, statistics were gathered showing that in eleven years lightning struck fifty-six oaks, three or four pines, twenty firs, but not a single beech tree, although seven-tenths of the trees were beech. It would seem, then, that one is safer in a storm under a beech tree than under any other kind.

The serum for snake bite sent from the Pasteur laboratory to the government bacteriologist at Agra has been used with success in the case of a native bitten by a cobra. A number of sheep that were bitten have been treated and saved. The report of the Pasteur Institute at Paris for last year shows that the number of persons treated were some 1,532, of whom only 5 died. Of these patients, 1,263 came from France and 93 from England and India.

The United States consul at Warsaw, Poland, reports that a second hygienic exposition, similar to the first, held in 1887, will take place at Warsaw. The date of the opening of the exposition will be May 15. It will continue for one month. The following list of the nine committees now at work will give an idea of the scope of the exposition: (1) physico-chemical; (2) parasital; (3) architectural; (4) pedagogical; (5) on hygiene of industry; (6) on hospitals; (7) pharmaceutical; (8) statistical; (9) public hygiene. Each of the above committees is composed of at least three members, selected from among the doctors of medicine, professors, engineers, and other specialists, all under the presidency of the general committee.

Prof. Roentgen, of Wurzburg, has been created a baron by Prince Ludwig of Bavaria, in recognition of his services to science in the discovery of the new radiation.

Perhaps there is nothing that so clearly explains the intense ignorance of the Turks as the fact that the censors of Turkey prohibit the importation of all educational books, this state of affairs being brought about by the discovery in one book of the formula H_2O, which the wise men of the court interpreted to mean: "Hamid II is naught—a cipher—a nobody.—Digest of Physical Tests.

A Berlin physician has devised what seems to be a rather novel method of imitating mother's milk, says the Medical Record. Cow's milk is fermented by means of rennet, and the whey thus obtained is carefully sterilized and then enriched, as required by different individuals, by the addition of cream.

A memorial tablet of bronze, to the late Prof. George H. Williams, will be placed in the Williams memorial room of the geological laboratory of the Johns Hopkins University. This room contains the collections made by Prof. Williams.

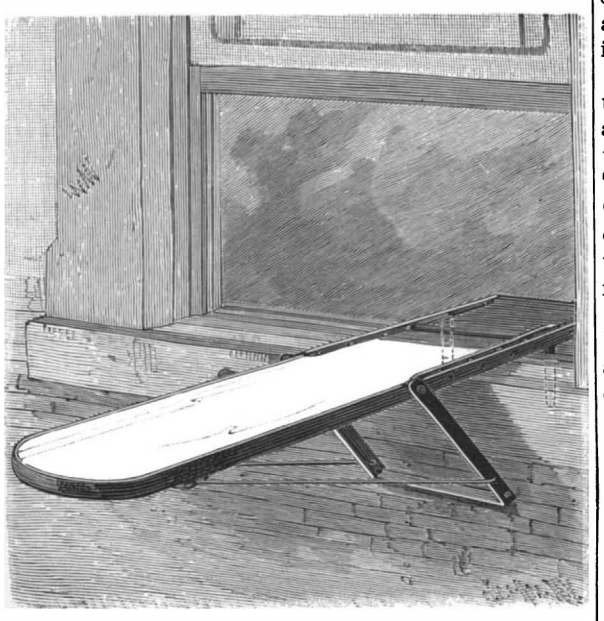
At a recent meeting of the Physical Society, Sir David Salomons showed some very interesting experiments with incandescent lamps. A large electro-magnet was excited by means of a continuous current while an alternating current was passed through an incandescent lamp. On bringing the lamp near the magnet the filament was set in vibration, which was sufficient to break it. The number and position of the nodes formed in the vibrating filament are found to be independent of the natural period of the filament, but depend on the frequency of the alternating current.

There are now six sanitariums in Germany at which consumptives are treated by constant exposure to cold air at a low temperature. Currents of cold air are allowed to pass through the bedrooms at night, and during the day as much of the time as possible is passed in the open air. It is said that the pure, cold air quiets the cough, lowers the temperature, arrests night sweats, improves the appetite, and modifies or arrests the disease.

Mr. Edwin Wheeler, a naturalist of Clifton, Bristol, has just presented to the Natural History Museum the results of the labor of years, in the shape of 2,449 water color drawings from nature, and species of fungi to be found in Great Britain. The drawings make twelve bulky volumes.

A SERVICEABLE PLATFORM.

The illustration represents a simple construction adapted to conveniently support a person when painting or washing windows, and similar occupations, and which may also be employed in constructing scaffolds and other supports inside and outside of a building. It has been patented by F. H. Reeder and A. R. Saxton, of 665 Union Street, West Philadelphia, Pa. On the under side of the outer end of the platform is pivoted a brace connected with a yoke adapted to abut against the wall of the building, and on the inner end of the platform is adjustably held a key adapted to engage the



REEDER AND SAXTON'S PLATFORM.

inside of the wall in a room, the inner vertical portions of the key being covered with leather or other soft material to prevent injury to the walls or woodwork. The key has a U-shaped middle portion adapted to rest on top of the platform, and its sides abut against pins projecting from the sides of the platform, the outer ends of the pins being secured to a bail which embraces the inner end of the platform. The key locks the platform in place, so that it will readily support a person on its extended portion.

The Electrical Resistance of Bismuth.

Continuing their researches on the electrical properties of the metals at very low temperatures, Profs. Dewar and Fleming have recently investigated those of bismuth, and in the Philosophical Magazine, 1895 (5), 40, 303-311, they publish an interesting paper on the electrical resistance of this metal. The substance of the paper is as follows: The resistance was determined in the case of three samples of bismuth: (1) commercial pure bismuth (A); (2 and 3) pure samples specially prepared (B and C), the temperature varying from 95° to 235° (platinum degrees). In each case the specific resistance at first diminishes, a minimum being reached at 50° pt. (B), —83° pt. (C), and 0° (A); after this the resistance increased, the temperature coefficient being negative. In the case of the commercial bismuth (A), a maximum was reached at about —200° pt., after which the temperature coefficient was again positive; but in the two pure samples no such maximum occurred, neither was there any indication that a maximum would be reached. It is noticeable that the change in the temperature coefficient of the pure bismuth (especially C) occurs at about the same temperature as that of the discontinuity in the thermo-electric power. It is also found that the effect of a magnetic field on the resistance of the metal is very much increased by reduction of temperature, an increase of 5 per cent due to a magnetic field reaching 25 per cent at the temperature of liquid air.

Cycling Notes.

The Brooklyn Bridge is now free to wheelmen, the toll of one cent having been abolished.

Count Leo Tolstoi, the Russian novelist, now rides the wheel, much to the astonishment of the peasants on his estate.

Silk for tires has been produced by a French tire maker. The silk is used instead of cotton fabric in the special racing tire.

One of the newest uses to which the bicycle has been put is its introduction as an aid to the life savers in patroling the beach.

It is said that all machines used in the French army are to be equipped with electric lights capable of being turned on or off at will.

The Patent Office statistics show, says the American Wheelman, that 2,388 styles of velocipedes have been patented in the last twenty-five years.

A company producing only one form of one part of a bicycle (the jointless rim) covers two acres of ground with its works at Birmingham, England.

It is said that last year barely five hundred tandems were ridden in the United States, but this year the call for the two seated wheel has been unprecedented.

The bicycle is proving of great use to the medical profession. In many cases the sick can be thankful that the doctor has a bicycle, and can thus be at the bedside in less time than that required for harnessing a horse.

An English trades union has refused to work with men who ride to their work on bicycles, on the ground that they have an unfair advantage in being able to work longer at the shop and yet get home at the same time as those who walk.

It is said that there are in and around New York City 150 cycling clubs, with a combined membership of 80,000. The annual dues amount to about $1,900,000 and the total number of miles ridden by these members is about 35,000,000 each year.

Cycle racing was one of the most interesting of the sports of the Olympian games in Athens. There are now six cycling organizations in Greece; five of them are in Athens, where there are about 400 riders. There are said to be 1,500 in the entire country. Prince George is an enthusiastic wheelman and is president of one of the clubs. The Grecian women have also taken to cycling, and nearly 100 of the Athenians now ride wheels.

A French bicycle maker is using roller bearings in his machines, the rollers taking the place of the balls and being prevented from touching each other by a cage which revolves with them. It is said that in ball bearings there is considerable friction between the balls themselves, as the points of contact between them are necessarily revolving in opposite directions, and that so completely is friction overcome in the roller bearing that no oil need be used. Similar contrivances have been used before and have been very generally abandoned.

In some of the railroads in France a simple contrivance is used to store the wheels in the baggage compartments; it consists of a pair of tongs which grips on strips of the roof of the car. To these tongs are attached a leather covered hook by means of chains. The frame of the bicycle rests in this hook; the bicycle is also caught to the side of the car. This plan removes the wheel from the floor space of the car, so that it does not interfere with any other class of baggage. Some of the Western roads of the United States have already provided bicycle racks.

A large part of the bicycles which are transported by railroads are carried by local trains, in which passengers consist almost wholly of suburban residents who do not take with them any form of personal baggage, aside from bicycles; so it is not believed that the bill compelling bicycles to be carried the same as baggage, which will probably become a law in New York State, will work much hardship to the railroads. A railroad in the South charges for the transportation of wheels, and the wheelmen, many of whom were large shippers of freight, retaliated, so that it is said that the profits of the road were very much reduced by this action.

The manufacture of the modern bicycle presents some delicate problems in mechanical engineering, caused by what engineers call the "factor of safety," which is lower in the bicycle than in almost any other mechanical product. In high pressure guns the factor is even as great as twenty, which means that the guns are made twenty times as strong as is theoretically necessary for the strain they must bear. In boilers it is about six. in bridges usually five, and in almost every construction of machines it is at least four. These wide margins of extra strength are considered necessary as an offset to the defects in construction and material and errors in theoretical computations. Riders of wheels insist on lightness, and in the construction of the bicycle the factor of safety is reduced to a very small margin, being as low in some instances as 1·25. In view of this fact it is easy to understand why makers of high grade machines maintain such a rigid system of inspection in their works.

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Electricity on Trunk Railroads.

BY WILLIAM BAXTER, JR.

When it became a demonstrated fact that electricity had achieved a complete success in the street railway field, the majority of electrical engineers claimed, or at least believed, that it would soon follow up its victory by an invasion of the trunk railways, and drive the locomotive off the tracks as effectually as it has driven off the horse cars. The main point on which they based their hopes for success was the supposed difference in coal consumption between compound and triple expansion condensing engines and the locomotive. They assumed that the latter burned from eight to ten pounds of coal per horse power hour, while the former could be depended upon to reduce the amount to something like one and a half pounds. It was soon shown by railroad experts, however, that high speed passenger engines are not so inefficient as the electrical engineers had assumed, and that on actual tests they could show results within four pounds per horse power hour. The difference between this figure and the best results obtained with triple expansion engines was not enough to show any great advantage in favor of electricity, after making the necessary deductions for the several losses in the transformation of energy and its conveyance to the moving trains upon the track.

These facts discouraged electrical engineers for the time being, but further investigation showed that, although the performance of locomotives on a test was highly efficient, the actual everyday results, as shown by the reports of a large number of roads, were considerably below these figures, and not very far from what they had been ordinarily supposed to be. Further investigation, on the other hand, shows that the average cost of fuel consumed by railroads amounts to about ten per cent of the total operating expenses; therefore, a saving of even half the coal would not be sufficient to justify the expenditure that would be necessary to equip a road electrically.

It would not be doing justice to electricity, however, to assume that the only way in which it could reduce the operating expenses of a road would be by effecting a saving in coal, for such is clearly not the case. A little reflection will show that, if consumption of coal and water along the track is stopped, the wages of all men employed in preparing them for use can be saved, and also the cost of repairs to water tanks, coal bunkers, etc. It is also evident that the cost of keeping locomotives in repair is greater than the amount that would be expended on motors doing the same work. The boiler and tender have no counterpart in the electric motor, therefore all the money expended in keeping these parts of a locomotive in repair would have to be checked off in estimating the difference between the cost of maintenance of electric motors and locomotives.

The smoothness of motion of the motor ought to materially reduce the wear and tear of the rolling stock as well as the roadway, and if the operation of trolley roads is anything to go by, the mileage of electric locomotives should be greater than that now covered by steam. Without going any further into details, it may be said that a careful analysis of the operating expenses of steam railroads will show a number of items that could in all probability be reduced by the adoption of electricity, and some that could be entirely eliminated. But, on the other hand, there would be other changes introduced, that would reduce to a considerable extent the apparent saving, so that it is far from certain that the net gain would be sufficient to pay the interest on the outlay that would be required to install an electric plant, although it might be enough to justify the adoption of the system for new roads.

Several branches of steam roads have been equipped electrically and their operation has been so successful as to lead to the belief that in this direction electricity will obtain a foothold; but most if not all of these branches run light cars, about half way between full size steam cars and trolley cars. Therefore, the results obtained on these branches are not a true indication of what could be done on the trunk lines, with full sized equipment.

The only electric installation where full size railroad cars are handled is that of the belt line tunnel in Baltimore. There the regular passenger and freight trains of the Baltimore and Ohio road are drawn through the tunnel by electric locomotives, and it has been demonstrated on several occasions that these motors are capable of doing the heaviest work that has ever been undertaken by steam.

Electrical engineers look upon the operation of this plant as a great triumph for electricity; but the friends of the locomotive take a diametrically opposite view. The former claim that this installation proves conclusively that electricity can handle with perfect success the heaviest kind of traffic, and that all doubts as to the possibility of transmitting a large amount of energy to a moving train by means of the trolley have been dispelled. The friends of the locomotive concede all this, but claim that the results have been obtained at a cost that is far in excess of what it would be with steam, and that, although the experiment has been demonstrated to be an engineering success, it is a financial failure. But it is doubtful whether this is a wise view to take of the case. It must be remembered that this is the first attempt that has been made to use electricity in railroad work on such a large scale, and, furthermore, that it was undertaken by the strongest corporation engaged in the electrical industry. They, no doubt, believed that the all-important thing was to achieve a complete success in the operation of the plant; and their engineers were, in all probability, instructed to bend all their efforts in that direction without regard to cost. If an undertaking succeeds, its costliness may be explained away by a plausible argument, but, if it fails, no amount of explanation can wipe out the fact that it did not succeed. The managers of the corporation that installed the Baltimore plant are noted for their sagacity, and are as likely to realize these facts as any one. Therefore, it is safe to assume not only that the work could be duplicated at a very great reduction in cost, but also that as good results could be obtained with far less elaborate apparatus if a similar work were undertaken again. As to the cost of operation, it must also be remembered that the power station is of sufficient capacity to do four or five times the work now being done, and this without any material increase in expenses; so that if the plant were run to its full capacity, the operating expenses per train mile would be considerably reduced, and might be lower than they are with steam under the same conditions.

As the matter now stands, it is fully demonstrated that electric motors are capable of handling the heaviest kind of railroad traffic. If the future should show that they can do the work at a cost sufficiently below that of steam to render the saving in operating expenses ten or fifteen per cent, the prospects of the locomotive, at least on new roads, will be anything but bright.

Natural History Notes.

Walrus Whiskers.—A peculiar but profitable industry among the natives of Alaska is the preparation and sale of walrus whiskers for toothpicks. Nature has armed the animal with whiskers that extend three or four inches out from its snout, and the apparent use of which is to enable it to detect the presence of an iceberg before actual contact has taken place. These whiskers are quite stiff, and this quality increases with age. After a walrus has been killed, the natives, with the aid of rude pincers, proceed to pull out each separate hair. After a thorough drying, these hairs are arranged in neat packages and exported to China, where they are considered a necessary appurtenance of a Chinaman of the upper class.

Habits of the Shad.—Of the sea life of the anadromous fishes, that is, those that come from the sea and ascend rivers to spawn, and afterward return to the sea again, but little is practically known. The shad, sturgeon and salmon are examples of such fishes.

The shad that seek the Hudson, for example, come in from the ocean in the spring and pass up the river to their spawning grounds. They take no food in fresh water, and, owing to this fact, and to the exhaustion due to spawning, many of them die. Those that escape the nets of the fishermen and survive the exhaustion of nature return to sea again late in the summer or early in the fall. A few remain here through the winter, but it is comparatively very few that do so. What becomes of the shad after they go out to sea, nobody knows. They have never been met with in any great body at sea. The congregate in schools, and do this from almost the beginning of their existence; and they are supposed to remain in schools after they go to sea. But where they go, or whether they remain, each river family or school by itself, perhaps in deep water in the ocean not very far from the river whence it came, or whether the several schools meet in one vast school covering a wide territory, no one can tell.

As regards salmon, it seems certain that some of these, at least, spend their sea life not far away from their rivers, for salmon have been caught at sea in northern waters off the New England coast on hooks baited for cod, haddock and halibut.

A Shepherd Bird.—The natives of Venezuela and adjoining countries on the north side of the Amazon often avail themselves of the services of a native crane to care for their poultry, and also, in the place of collies or shepherd dogs, to herd their domestic animals. This remarkable bird, which the Indians call "yakamik," and naturalists, Psophia crepitans, is found in a wild state in the great forests that lie between the northern coasts of South America and the Amazon River, particularly in Venezuela and British Guiana. The birds never leave the forest unless captured. They travel in flocks of from 100 to 200. Their usual gait is a slow and stately march, but they enliven themselves from time to time by leaping into the air, executing eccentric and fantastic waltzes, and striking the most absurd and preposterous attitudes. When alarmed, they utter a peculiar cry that has obtained for them the name of "trumpeters."

These birds are very easily tamed, and prove valuable servants to the natives, who domesticate them, and as they are courageous and will protect animals intrusted to their care at every risk to themselves, even dogs are obliged to yield to their authority. They may be trusted with the care of a flock of sheep or domestic fowls, and every morning will drive the ducks and chickens to their feeding place, and, carefully collecting any stragglers, bring them safely home at night. A yakamik soon learns to know and obey the voice of its master, will follow him wherever he goes, if permitted, and appears delighted at receiving his caresses. It repines at his absence and welcomes his return, and is extremely jealous of any rival. Should any cat or dog approach, it flies at it with the utmost fury, and, attacking it with wings and beak, drives it away. One quality that makes the bird valuable is its homing sense, which is perfect. However far it may wander with the flocks or herds that it guards, it never fails to find its way home at night with the animals intrusted to its care.

It is strange that several species of South American birds of different genera should share with the yakamik its instinct of guarding and taking care of domestic animals. One of these is the crested screamer (Dicholophus cristatus), and another the horned chauna (Chauna chavaria), which is often domesticated as a poultry keeper by the natives.

The Age of Trees.—The age of trees, provided these reach exceptional dimensions, is a subject upon which fancy delights to exercise itself, and there is no traveler, says the Revue Scientifique, to whom innkeepers, guides and stage coach guards have not narrated extraordinary things about the age of trees that were a little out of the common as regards size. From this point of view it is of interest to call attention to the conclusions of Mr. Gericke, a German forester, who asserts that the oldest trees in Germany, of which the age has been ascertained with certainty, are not more than 500 or 570 years old. It is the conifers that appear to reach the most advanced age. Among the group of trees with deciduous leaves, the oak appears to attain the greatest longevity. Mr. Gericke mentions one at Aschaffenburg 410 years of age. We know to a certainty of beeches 245 years old, of birches of from 160 to 200 years, of poplars of 220 years, of ashes of 170 years, of elms of 130 years, and of alders of 145 years. We are here far from the 500, 1,000, and 1,500 years that legend often attributes to trees; but it must not be concluded that trees of 1,500 years cannot exist. What cannot exist is the authentic proof of their age as long as they remain standing; and the estimation of their age by counting their annual rings after they are felled leaves the door open to serious errors.

Nervousness of Motormen.

The following statement of the nervous condition of men who are employed to operate some of the modern systems of transportation in the cities will be read with interest by all medical men:

Neurologists are watching with a considerable degree of interest a new expression of a nervous malady which has made itself manifest since the introduction of the Broadway cable cars and the Brooklyn trolley system. With the exception of Chicago, there are no other cities possessing anything like the street traffic of New York and where these methods of transportation are in operation. A nervous condition, not at all like the usual nervousness that is excited by great noise, confusion, or sudden danger, has developed itself in several gripmen employed on the Broadway road, and among the motormen employed on the Brooklyn trolley lines.

The constant lookout for collisions in the congested district below Canal Street, in Broadway, keeps the gripman in a state of extreme nervous tension from the time he goes on his car until he goes off. Besides keeping an eye open for visible trouble, his mind is fixed on possibilities that are under his feet. He does not know just when there is to be a pooling of interests between the grip and a broken strand in the cable, which will whisk him along the street, crashing into trucks, smashing wagons, frightening pedestrians and exasperating policemen. This continuous strain results, first, in sleeplessness, then in a falling off in appetite and extreme irritability; after this a tremor in the facial muscles. At the expiration of a week, says the Medical Examiner, these symptoms disappear, and may not return for ten days, but thereafter the intervals are regular and are about one week apart—seven days in a state of nervous terror and seven days in a normal, apparently healthy condition. These exhibitions apply only to men of nervous, nervo-sanguine, and bilious temperaments. While present in other temperaments, they are not pronounced.

DURING the late war Japanese surgeons are said to have employed, as a dressing for wounds, the ash of rice straw. This was freely applied after the wound had been cleansed, and sublimate gauze or linen was then superposed and held in position. The ash is said to act as a perfect antiseptic, its properties in that respect being attributed to the presence of potassium carbonate, and it is certainly the cheapest dressing on record.—Pharm. Jour.

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THE AMERICAN GAS MACHINE.

Low priced gas means economical lighting, heating and power, and an isolated gas plant insures independence and convenience, and in many cases it affords the luxury of a good gas light where otherwise only kerosene lamps or something worse would be possible.

We give herewith engravings of a simple automatic gas machine made by the New England Gas Machine Company for manufacturing gas for lighting and fuel purposes and for power, on either a large or small scale. This machine consists of the pump, the aerometer, the carbureter and the oil tank. The automatic hydraulic air pump is formed of two cylindrical galvanized iron vessels, one being made smaller than the other, in which it is inverted, forming a vessel similar to a small gasometer. The lower vessel is furnished with a water seal which permits the upper one to rise and fall while maintaining an air tight joint. A motor cylinder is attached to the bottom of the lower vessel and is provided with pistons attached to the upper or movable vessel, and water under a pressure of 20 pounds or more to the square inch is introduced into the motor cylinder under the piston, causing the piston to rise and lift the movable upper vessel. This draws air in through the check valve at the bottom of the stationary vessel, and when the piston reaches the upper end of the motor cylinder, an automatic trip works the valve which cuts off the water supply, and weights placed on the top of the movable vessel force it down. The air contained by the vessel is forced through the connecting pipe to the aerometer in which the air is stored, and as soon as the upper vessel in the pump reaches the lower end of its excursion, the automatic trip turns the water on again and the upper vessel of the pump ascends, thus drawing in another supply of air, and this operation continues automatically as long as gas is being used.

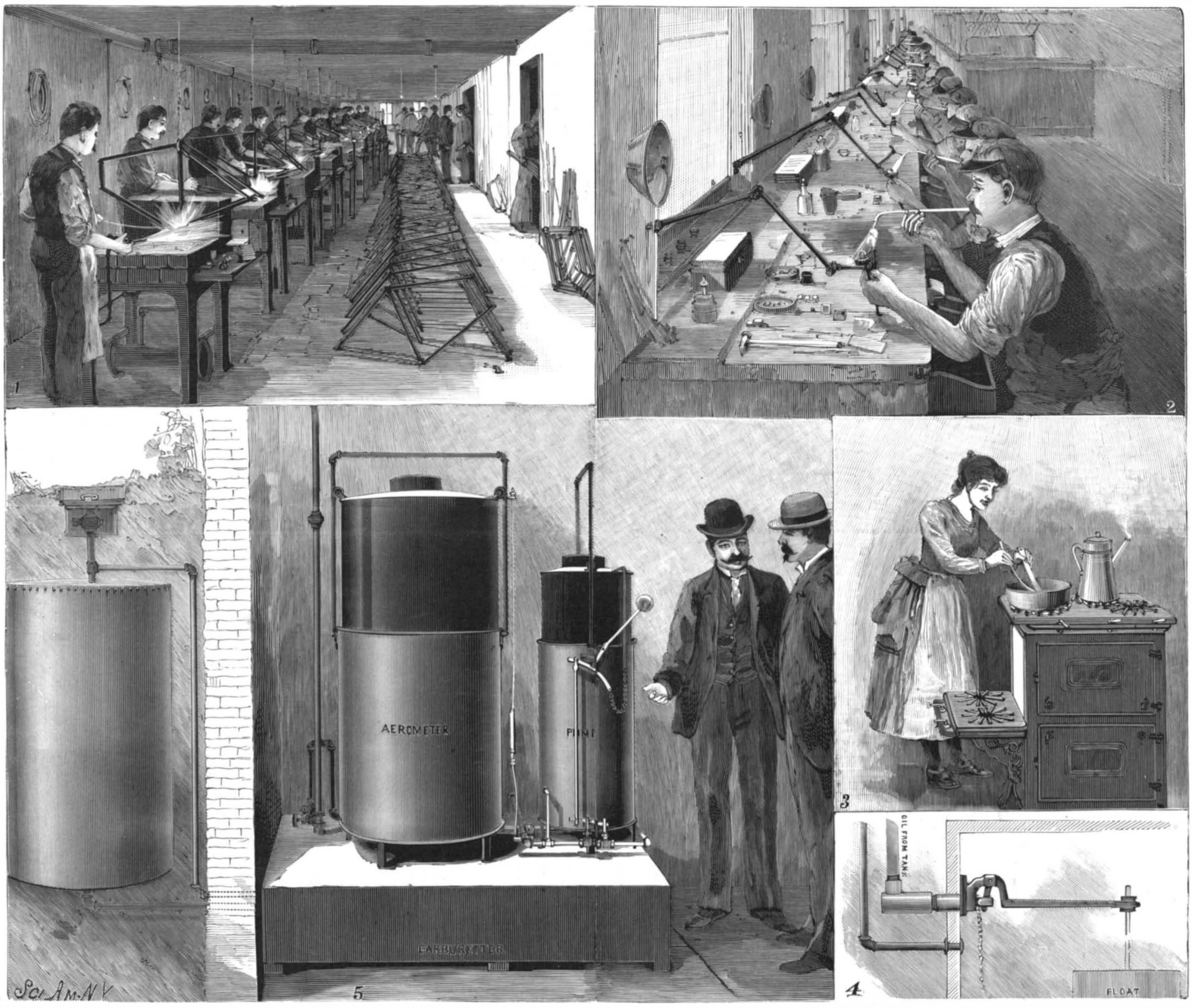
The aerometer is constructed like a small gasometer, and it serves to give an even, steady pressure to the air, sufficient to force it through the carbureter and delivery pipes. The flow of water to the motor cylinder is governed by the amount of air in the aerometer. When the aerometer is full, it shuts off the water supply, and the upper part of the aerometer, in descending, automatically turns the water on when it reaches a certain point in its descent.

From the aerometer the air passes under an even pressure directly to the carbureter, where it becomes thoroughly saturated with the vapor of gasoline. The gasoline is allowed to flow into the carbureter until there is a sufficient depth of liquid to raise a small float which operates a valve similar to a ball cock, and this valve maintains an even depth of gasoline in the carbureter. The carbureter is divided into a series of narrow compartments by metal partitions running parallel, the compartments opening into each other on alternate ends, thus forming a long tortuous passage for the air. These compartments contain absorbent material which rests on the gasoline at the bottom and draws it up to a height of four or five inches, so that the air in passing through the absorbent material takes up the vapor of the hydrocarbon and becomes thoroughly carbureted. It then passes through a mixing chamber where the minute particles or molecules of hydrocarbon are intimately mixed with the air. Any surplus of gasoline passes back into the carbureter. The carbureter is inclosed in a tank of heavy cold rolled copper, and sealed gas tight and covered with a casing of wood, which is incased in a heavy galvanized iron casing, which is made gas tight.

The oil tank is a reservoir from which the gasoline is supplied to the carbureter. It is usually buried in the ground outside the foundation wall of the building containing the gas plant. The gasoline is preferably taken from the bottom of the tank, thus insuring uniformity in quality of the gasoline and avoiding any waste or residuum, at the same time insuring an even quality of gas. From the carbureter the gas passes through pipes of the same size and in the same manner as ordinary city gas and is used in the same way.

The accompanying illustrations show the gas-producing plant and give an idea of the adaptability of this gas to mechanical as well as to domestic purposes. The flame produced by gasoline gas is superior in heating qualities to the flame of ordinary gas. It is much used by manufacturers of bicycles, jewelry, tools, machines for brazing, soldering, enameling, tempering, welding, moulding, forging, and a great variety of purposes. For domestic uses it makes an economical and safe fuel for both heating and cooking. It is claimed for the gas made by this machine that it has double the candle power of ordinary gas.

The American gas machine is manufactured by the New England Gas Machine Company, at Attleboro, Mass., with offices at No. 42 Oliver Street, in Boston, and at Attleboro.



1. Brazing bicycle frames. 2. Making jewelry. 3. The gas stove at home. 4. The automatic gasoline valve. 5. The complete gas apparatus.

GAS MACHINE FOR INDUSTRIAL AND DOMESTIC USES.

Niagara Power.

Power from the dynamos of the Niagara Power Company will be transmitted to New York over 462 miles of wire, on May 5. The Western Union Company will furnish one of their largest cables to transmit the current. The current will not be heavy, but will demonstrate, it is thought, that by Tesla's new system the current can be conveyed long distances. It is expected that Governor Morton will turn on the current from Niagara at the opening of the National Electrical Exposition on May 5.

THE recent discovery of argon in atmospheric air by Lord Rayleigh and Prof. Ramsay has aroused such general interest that a volume containing an account of the methods of extracting the new gas from air and of its property, has been written by Prof. Ramsay.

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MAGNETOGRAPHS MADE BY RADIATIONS FROM THE POLES OF A MAGNET.

BY PROF. JOHN S. McKAY.

If a paramagnetic substance be placed upon the sensitive film of an ordinary photographic plate and the poles of a magnet, either a permanent or an electromagnet, be brought near to the other side of the plate and left for a time, the plate, when developed, will show a clearly defined image of the object. Positives made from such plates will give in shadow the outlines of any object used as armature. Thus may be obtained clearly defined silhouettes of a key, a wire gage, a pair of pliers, or any iron or steel implement used as armature.

If the plate be placed with its sensitive side facing the poles of the magnet and a disk of iron nearly as large as the plate be placed on the opposite side in the position of armature, "shadowgraphs" of any non-magnetic or diamagnetic bodies placed on the other side, between the plate and the poles of the magnet, will be produced upon the plate. The shadow pictures produced by either of these methods are as clear and distinct as those produced by Roentgen rays. I have obtained dark shadows with a compound steel magnet weighing little more than a pound. If strong electromagnets are used, the poles may be separated several inches from the plate. With an electromagnet capable of lifting a hundred pounds or more, I have made a "magnetograph" through a block of wood two inches in diameter. The object whose image is to be impressed upon the plate must be in contact with the sensitive film; a thin sheet of mica or paper seems to prevent the action, or at least to decrease the effect more than the removing of the poles several inches. The best results seem to be secured by suspending the magnet in a vertical position, so that the plate and the keeper will be held up against the force of gravity, as shown in Fig. 1, but that arrangement is not essential to success. In experimenting with electromagnets the objects were placed on the plate, and the plate was wrapped in several folds of black paper in the dark room. The plate was thus very perfectly protected from light throughout the experiment.

The image shown in Fig. 2 was produced with the apparatus arranged as shown in Fig. 1.

In the case of an electromagnet, varying the current by means of a rheostat or frequently making and breaking the circuit seems to facilitate the formation of the images. The time of exposure does not seem to be a matter of great importance, although the plate is evidently darkened more and the contrast increased by a long exposure. I have, however, obtained as clear an image in five minutes as with the same magnet after an exposure of ten hours. It would seem that the action is largely due to the approach or removal of the armature or to the change of current strength. I judge this to be true for the reason that the slightest change in the position of the object immediately after being placed in the field produces a double shadow of nearly equal intensity. In one case a key was used as an armature. In suspending the magnet in the dark closet the plate and key fell from the poles. They were immediately replaced in what was supposed to be the original position. When the plate was developed ten hours later, it showed two images of the key of nearly the same intensity, overlapping, with ends reversed. The experiments with permanent magnets were all made in the dark room and the plates were not covered. I used the Cramer Crown plates and eikonogen developer.

The results of these experiments are given with the hope that they may prove interesting and perhaps helpful to those who are trying to solve the great Roentgen conundrum. They seem to indicate that the ether in the field of a magnet is in a state of permanent stress, perhaps due to ether vortices, and that any change in magnetic force caused by motion of the armature or variation of current strength produces a change in the degree of stress, and thus originates ether waves capable of affecting the ordinary photographic plate. There does not seem to be any difference in the radiations from the two poles, since the plate is equally darkened on all sides except where protected by intervening objects. Conductors seem to be the most opaque to these magnetic radiations, possibly by converting the energy of the waves into eddy or Foucault currents. It is not clear why the armature should protect the plate beneath it. One would naturally expect that there it would be affected the most.

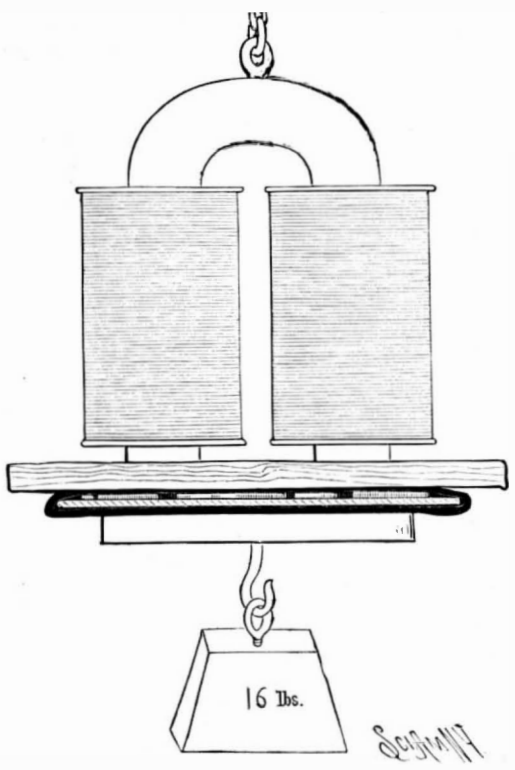


Fig. 1.—ARRANGEMENT OF MAGNET AND PLATE FOR THE MAGNETOGRAPH.

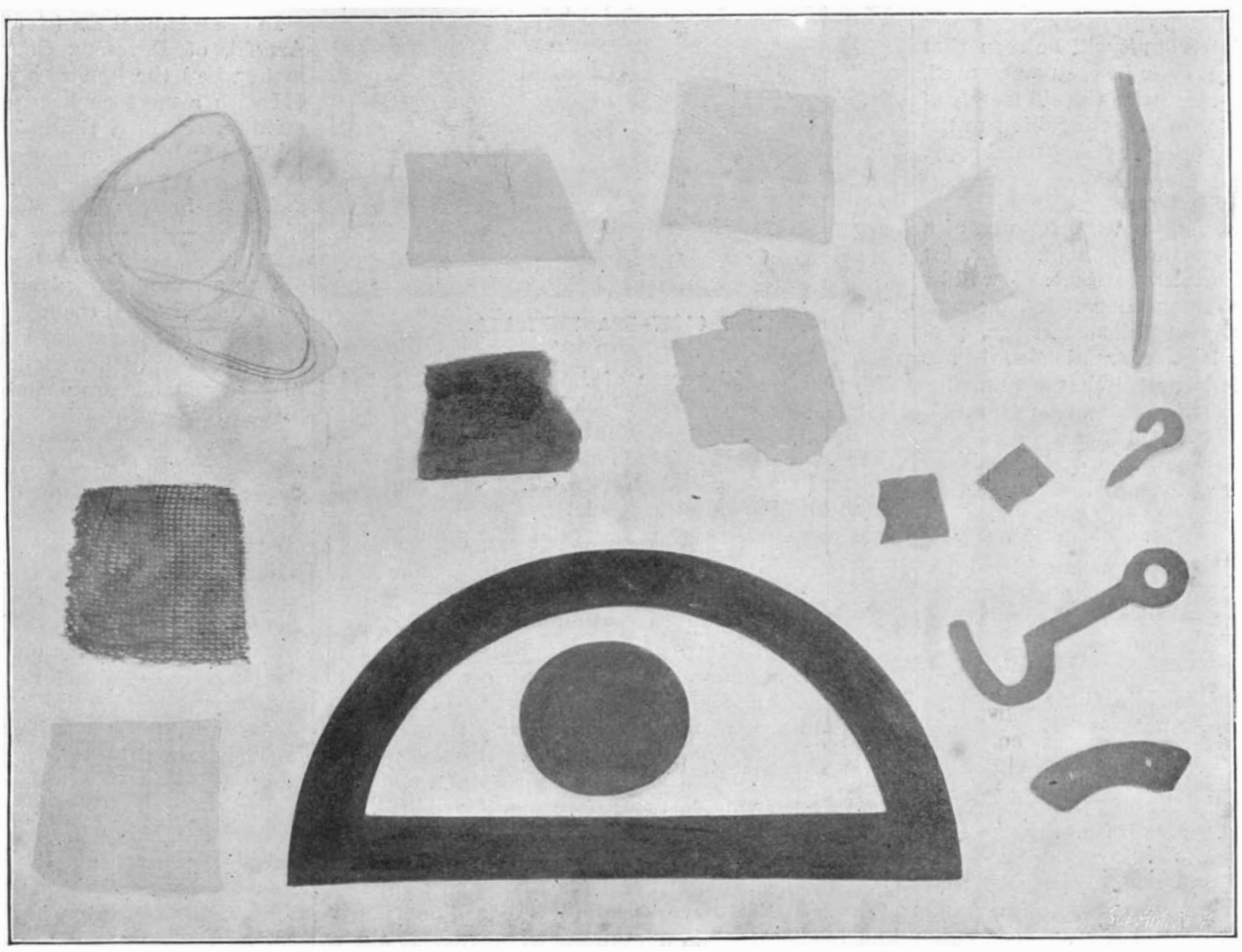
Perhaps the shadow pictures produced by long exposure to sunlight, and which some think to be a Roentgen effect, may be caused by magnetic waves from the sun. And may not the Roentgen rays themselves be something analogous to these magnetic rays? May not the Roentgen effects be due to the magnetic component of a Hertz wave?

A Few Kinks in Brazing.

Brazing, says the Boston Journal of Commerce, is getting to be quite an art now that bicycle mending is coming in from all directions, and the way some of these thin steel tubes for the framework are handled down by the furnace door of an establishment is enough to make one think that soft coal and water gas must be selling cheap. Spelter is used that will melt a trifle below the fusing point of common brass, and, if it is not already granulated, it must be worked into fine powder with a file. A supply of borax is the next thing to look out for. Then if there is a gas jet handy an artificial blast can be sent through a burner of the Bunsen type and quite a heat is directed on a bed of charcoal, where the delicate work is supposed to be buried waiting for the brazing. The joint to be brazed is to be made as firm as possible by having a close fit well pressed together, so much so that it will stand the sharpest raps of the poker, for when the brazing materials first melt and are well absorbed in the joint it is a relief to realize what a rap will do toward working the solder through the joint and knocking off the waste material. The borax is first spread over the joint as the work is approaching a low red heat, and it soon swells up and turns into a snow-like froth, on account of the water of crystallization boiling out of it, settles down and flows over the joint like glass, ready to clean off the surface and prepare the way for the soft brass that is about ready to melt under this temperature. Then comes the green blaze that is always a sure index that the work of sweating the joint with brass is being performed. The zinc, to which is due the green blaze, when the brass flashes, is employed in the brazing material to reduce the melting point of brass, and, when it volatilizes and gives off the fumes that produce the colored blazes it leaves the brass behind in a less fusible state. It stands the brazer in hand, then, to prepare all the work with the brass in position and to heat it so carefully that none of it will melt till the joint is well heated all alike and every portion settles down at the same moment. Borax is a substance that is supposed to dissolve all the rust and every kind of earthy substances and make a clean surface, no matter how the work is brought together, but the surfaces that are found on both the inside and outside of steel pipes, as well as drop forgings, will need to be cleaned off by some other treatment, in which a file or scraper will be found useful. With sheet iron a joint can be brazed by using filings from soft cast iron in the same way as if it were brass, and a joint produced that will pass for welding. In all kinds of brazing the substance used for this purpose is inclined to etch the edges of the work and mar the surfaces wherever they have been exposed to the fused material, with the exception of silver. When used for a solder silver has such a liking for iron and steel that it will take hold without any of that biting action whatever, and when we come to see how economically it can be used for these purposes, it would seem to be the cheapest material in the end.

A Simple Seismoscope.

A simple instrument for recording the time of occurrence of an earthquake is described by Prof. C. F. Marvin in the United States Monthly Weather Review. A heavy lead weight is suspended on a short steel link, to which it is pivoted by means of a sharp pointed screw, the point being just above the center of gravity of the weight. A similar pointed support is provided for the top of the link, which hangs from a small projection in the frame of the instrument. The link is prolonged upward as a needle about six inches long, the top of which passes through a small hole in a plate connected with the frame. The plate is electrically insulated from the rest of the instrument. A movement of the ground is magnified by the end of the needle, and the contact of the needle with the sides of the hole in the plate can, by connection with suitable electrical apparatus, produce an automatic record on a sheet of paper. The recording apparatus used with it is the so-called "weekly anemometer register," and the time of a disturbance can be read to less than half a minute.



RADIOGRAPHS PRODUCED BY A MAGNET.

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A SIMPLE METHOD FOR THE MEASUREMENT OF ELECTRIC CURRENT.

BY ICHIRO GOTO.

It may sometimes occur that the strength of an electric current is desired to be known when no measuring instrument is at hand. The following method which I have devised is very useful on such occasions, as nothing is required except a scale and a magnetic needle.

A small magnetic needle is suspended from a silk fiber and held vertically over a horizontal wire, say three feet long, a few centimeters under the center of the needle, the wire having a direction perpendicular to the magnetic meridian (Fig. 1). The current which it is desired to measure is then passed through the horizontal wire and in such a direction that its magnetic force on the needle is opposite to that of the earth's field.

By adjusting the height of the needle, a position can readily be found where the magnetic forces due to the earth and the current neutralize each other, at which point the needle acts as if it had lost its magnetism. Measuring this height of the needle above the wire gives the data required for substitution in the following formula:

Let d equal the height of the needle in cm., I the current strength in C. G. S. units, and H the horizontal intensity of the earth's magnetic field, also expressed in C. G. S. units. Then, since the strength of the field due to the current in the wire is expressed by $\frac{2\,I}{d}$, evidently in the neutral position,

$$H = \frac{2\,I}{d}, \text{ or } I = \frac{d\,H}{2};$$

or, since I is in C. G. S. units, the current, C, in amperes

$$= \frac{10\,d\,H}{2} = 5\,d\,H.$$

In Tokio H is very nearly 0·3, so for that place the formula becomes C = 1·5 d.

By this method I measured several currents which in another room were simultaneously measured with a Kelvin ampere balance as accurately as possible. The two results being compared, I found, much to my surprise, that there was a difference of only from 2 to 5 per cent between them.

For large currents the wire should be so arranged as to diminish the magnetic force on the needle due to the current, and Fig. 2 shows an arrangement for such a case. Similarly, for small currents the arrangement should be such as to increase the magnetic effect, as sketched in Fig. 3.

In the two foregoing cases the formulas are somewhat different, but yet remain simple of calculation. In the case of heavy currents (Fig. 2),

$$C = 5\,d\,H\left(1 + \frac{d}{D}\right) \text{ amperes.}$$

In the case of small currents (Fig. 3),

$$C = \frac{5}{n}\,d\,H\left(1 + \frac{d}{D}\right) \text{ amperes,}$$

where D is the distance apart of the parallel wires in cm. and n is the number of loops.

By the method here pointed out it will be seen that any current (strong or weak) can be easily measured, and with considerable accuracy, with the aid merely of a magnetic needle and scale. We are indebted to the courtesy of the Electrical World for the cut and copy.

The Horseless Carriage Bill.

We give below, from the Engineer, the full text of a bill, which was introduced in the House of Lords, for regulating the use of the horseless carriage. It will be seen that it is proposed to remove all restrictive enactments from a mechanically propelled carriage, provided it be under two tons in weight, unloaded, be not employed in traction, and do not discharge smoke or visible vapor. Such a carriage, as might be expected, is to be subject to general regulations applicable to traffic on highways, and Section 26 of the Highways and Locomotives Act, 1878, is to apply. That section confers upon county authorities power to make by-laws for prohibiting the use in any vehicle, whether drawn by horses or not, of wheels of unsuitable width, or having projecting studs or bars of a pattern forbidden by such regulations, and also for prohibiting the locking of a wheel in descending a hill, unless a shoe be used.

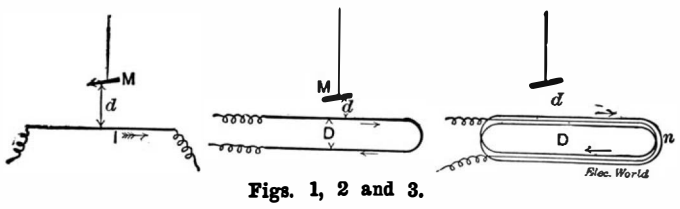
(1) The enactments mentioned in the schedule to this act, and any other enactment restricting the use of locomotives on highways and contained in any public, general, or local and personal act in force at the passing of this act, shall not apply to any vehicle propelled by mechanical power, if it is under two tons in weight, unladen, and is not used for the purpose of drawing any other vehicle, and is so constructed that no smoke or visible vapor is emitted therefrom, and vehicles so exempted are in this act referred to as light locomotives.

Provided as follows:

(a) Nothing in this section shall affect any power for the general regulation of traffic on highways, and a light locomotive is hereby declared to be a carriage within the meaning of the enactments relating to highways;

(b) Section 26 of the Highways and Locomotives (amendment) Act, 1878, and the enactments relating to hackney carriages and stage carriages respectively, shall apply to light locomotives as if they were drawn by animal power, and the said Section 26, as so applied, shall extend to London; and,

(c) So much of Section 6 of the Locomotives Amendment (Scotland) Act, 1878, and of Section 6 of the Public Health (Ireland) Amendment Act, 1879, as gives power to regulate the use of locomotives shall apply to light locomotives.



Figs. 1, 2 and 3.

(2) The keeping and use of petroleum or of any other inflammable liquid or fuel for the purpose of light locomotives shall be subject to regulations made by a Secretary of State, and regulations so made shall have effect notwithstanding anything in the Petroleum Acts, 1871 to 1881, and breach of any such regulation may, on summary conviction, be punished by a fine not exceeding £2.

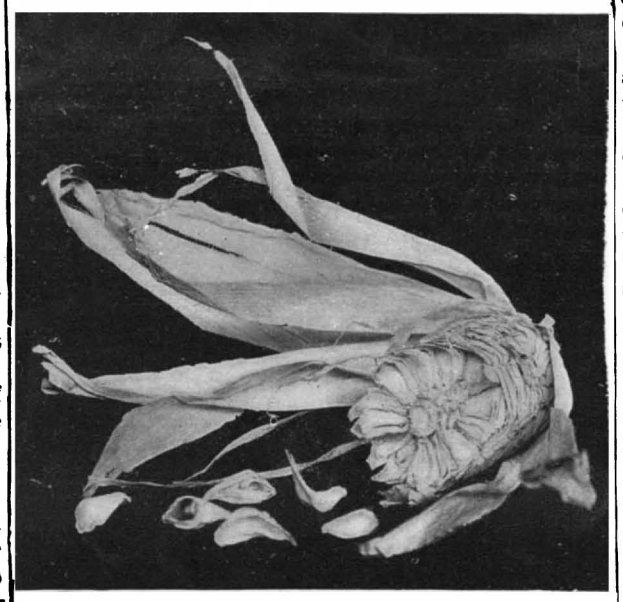
(3) If any person negligently drives a light locomotive, or suffers it to be without due control, he shall be liable on summary conviction to a fine not exceeding £10.

(4) The local government board may make regulations with respect to the use of light locomotives on highways, and a breach of any such regulations may be thereby made punishable by a fine not exceeding £10, recoverable on summary conviction.

(5) This act may be cited as the Locomotives on Highways Act, 1896.

POD CORN—ZEA TUNICATA.

We give an engraving of an ear of corn having each kernel inclosed in a separate husk. It was sent by Mr. George B. Matthews, of New Orleans, who supposed it was merely a freak of nature; but Mr. F. V. Coville, botanist of the United States Department of Agriculture, to whom the specimen was submitted for examination, says the corn is known as Zea tunicata, or pod



POD CORN—ZEA TUNICATA.

corn, considered by some of the best authorities to be the primitive form, from which have been derived the different varieties of pop, dint, flint, and sweet corn.

This variety has been found growing apparently wild in Paraguay and Mexico. The fact that individual kernels of ordinary varieties of corn are sometimes surrounded with a husk makes it probable that the podded corn was the original type.

Minute Workmanship.

In the twentieth year of Queen Elizabeth, says an English contemporary, a blacksmith named Mark Scaliot made a lock consisting of eleven pieces of iron, steel and brass, all of which, together with the key to it, weighed but one grain of gold. He also made a chain of gold, consisting of forty-three links, and having fastened this to the before mentioned lock and key, he put the chain round about the neck of a flea, which drew them all with ease. All these together, chain and flea, weighed only one grain and a half.

Oswaldus Northingerus, who was more famous even than Scaliot for his minute contrivances, is said to have made 1,600 dishes of turned ivory, all perfect and complete in every part, yet so small, thin and slender, that all of them were included at once in a cup turned out of a peppercorn of the common size.

Johannes Shad, of Mitelbeach, carried this wonderful work with him to Rome, and showed it to Pope Paul V, who saw and counted them all by the help of a pair of spectacles. They were so little as to be almost invisible to the eye.

Johannes Ferrarius, a Jesuit, had in his possession cannons of wood, with their carriages, wheels and other military furniture, all of which were also contained in a peppercorn of the ordinary size.

An artist named Claudius Gallus made for Hippolytus d'Este, Cardinal of Ferrara, representations of sundry birds sitting on the tops of trees, which, by hydraulic art, and secret conveyance of water through the trunks and branches of the trees, were made to sing and clap their wings, but at the sudden appearance of an owl out of a bush of the same artifice, they immediately became all mute and silent.

Myrmecide wrought out of ivory a chariot with four wheels and as many horses in so little room that a small fly might cover them all with her wings.

It is stated that the Salem Museum, Massachusetts, has in its possession a cherrystone containing a dozen silver spoons. The stone is of the ordinary size, the spoons being so small that their shape and finish can be distinguished only by the microscope.

Dr. Oliver gives an account of a cherrystone on which were carved 124 heads, so distinctly that the naked eye could distinguish those belonging to popes and kings by their miters and crowns.

A Nuremberg top maker inclosed in a cherrystone, which was exhibited at the French Crystal Palace, a plan of Sebastopol, a railway station, and the "Messiah" of Klopstock.

A Swede, named Leibshon, executed a portrait of King Oscar, in microscopically small letters, forming shorter or longer extracts from the Bible. He has also made, in a similar manner, what may be called "a speaking" likeness of Emperor William. The right eye consists of choice voices from the Psalms of David; the left of verses from Solomon's Proverbs, the Book of the Chronicles, and the Song of Solomon. The head consists of the whole Book of Kings. The uniform is composed of the Proverbs of Solomon and the Psalms of David. The name of the emperor is composed of a Hebrew prayer for the imperial family and two of the Psalms of David.

Peter Bayle, a clerk of chancery in the time of Queen Elizabeth, once wrote the Lord's prayer, the creed, the commandments, two prayers, and his own name and office in addition to the year, month and day of the Queen's reign, in characters so small as to be inclosed "in the head of a ring," which ring was afterward accepted by the Queen, and was worn on the august finger.

We have Pliny's statement that in his time there existed a copy of Homer's "Iliad" small enough to go into a nutshell, and a German, Prof. Schreiber, produced only a few years back, by the stereographic process, a copy of the German translation, extending to 600 pages, of both the "Iliad" and the "Odyssey," so small that a nutshell held the whole comfortably.

In the "Annual Register" 1764 it is stated that "Mr. Arnold, of Devereux Court, in the Strand, watch maker, had the honor to present his Majesty George III with a most curious repeating watch of his own making, set in a ring. The size of the watch was something less than a silver twopence; it contained 120 different parts, and weighed five dwts. seven grains and three-fourths."—Boston Journal of Commerce.

How Nails Are Named.

Two accounts are given of the origin of the terms "sixpenny," "eightpenny," "tenpenny," and so on, as applied to the various sizes of nails. According to one statement, when nails were made by hand the penny was taken as a standard of weight, and six were made to equal the weight of a copper penny. This explanation is open to criticism on account of the very small size of the nails, of which six were needed to balance even the large sized, old fashioned copper penny. Others are much more probable. One explanation holds that tenpenny nails originally sold for tenpence a hundred, sixpenny nails for sixpence a hundred and so on, the smaller nails selling for the lower price. Another explanation is that 1000 nails of the tenpenny size used to weigh ten pounds, 1000 of the sixpenny size six pounds and so for other sizes. Of the ordinary sixpenny nails there are eighty to the pound; of the eightpenny, there are fifty; tenpenny, thirty-four; twelvepenny, thirty-nine.

THE Swiss National Exposition begins at Geneva, Switzerland, May 1 next, and terminates October 15. Theodore Turrettini, mayor of Geneva, and one of the most distinguished electrical engineers in Europe, is president of the exposition, and the electrical exhibit will be the finest ever seen. The River Rhone supplies 12,000 horse power, to be electrically transmitted six miles to the grounds. There will be a traveling footpath, operated by electricity, traversing the great Machinery Hall.

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STRAIGHTENING A LEANING CHIMNEY ONE HUNDRED FEET HIGH.*

It will perhaps be interesting to those having similar property, or to any who may have similar work to do, to know how a brick chimney 100 feet high, which leaned about 28 inches, was made plumb. This chimney is that of the Ormsby Textile Company, of Waterford, N. Y.

It was erected in 1893. Soon after its completion it was found to be considerably out of plumb; and when first measured, in November, was found to lean about 16 inches, and a few days later 22 inches. Then the rate of increase of inclination became less, but in March, 1894, it was 28⅛ inches out of line, and it was decided to attempt to straighten it. The factory to which the chimney is attached stands on the north side of the north outlet of the Mohawk River, and distant perhaps one-third of a mile from the west bank of the Hudson. The underlying rock in this part of the country is the Hudson River shale. Where this rock comes to the surface it is very irregular in shape, and is probably equally so where it has been covered by the earth deposit.

The chimney proper is rectangular in plan, is built of brick, is 9 feet 6 inches square at the bottom and 5 feet 4 inches square at the top; it is 100 feet high and has a central flue 3 feet square. The estimated weight of this is 206 tons. It stands upon a foundation which is 14 feet deep, the lower 4 feet being of concrete about 14 feet square, on which rests heavy stonework 10 feet high, 14 feet square at the bottom and 9 feet 6 inches square at the top. The weight of the foundation is about 149 tons, making a total of 355 tons, resting on 196 square feet—about 1·8 tons per square foot.

Before commencing the work, soundings were made on all sides of the proposed site. These varied from 20 to 38 feet in depth below the natural surface of the ground, and indicated the same character of soil as its surface—a soft alluvial deposit with streaks of sand, but with no hard material or rock or bowlders. The chimney was built upon this soil, without the use of any piles. Two similar chimneys have been built in the immediate vicinity on what appeared to be similar material, and no trouble had been experienced with these. The bottom of the concrete is about 2 feet above normal summer level of the Mohawk River, but at the time of sounding in March it was submerged about 4 feet, it being found that the water rises and falls in the soil in the vicinity with the rise and fall of the river.

The work of straightening the chimney commenced on the 19th day of March, 1894. A scaffold was erected about the chimney, and eight oak timbers, 6 inches by 10 inches by 10 feet were placed vertically at the corners, at a height of 42 feet above the stonework and 4½ feet below the center of gravity of the brickwork; the object of the oak timbers being to spread the bearing of the wire ropes over as large a section as practicable.

Wire ropes were passed around the timbers, and another wire rope two and one-half inches in diameter, with an eye in each end, was fastened to the first mentioned ropes at its upper eye. The lower eye was connected with a system of pulleys secured to the dock at the river edge at a point 78 feet distant and directly opposite the direction in which the chimney leaned, the pulleys being made up of three sets of double and single blocks connected together in series, having three points of fastening to the dock and having eleven pulleys in the system. Cables were also put out from the chimney on each side at right angles to the main cable, and having turnbuckles to tighten them; also a guard cable in rear.

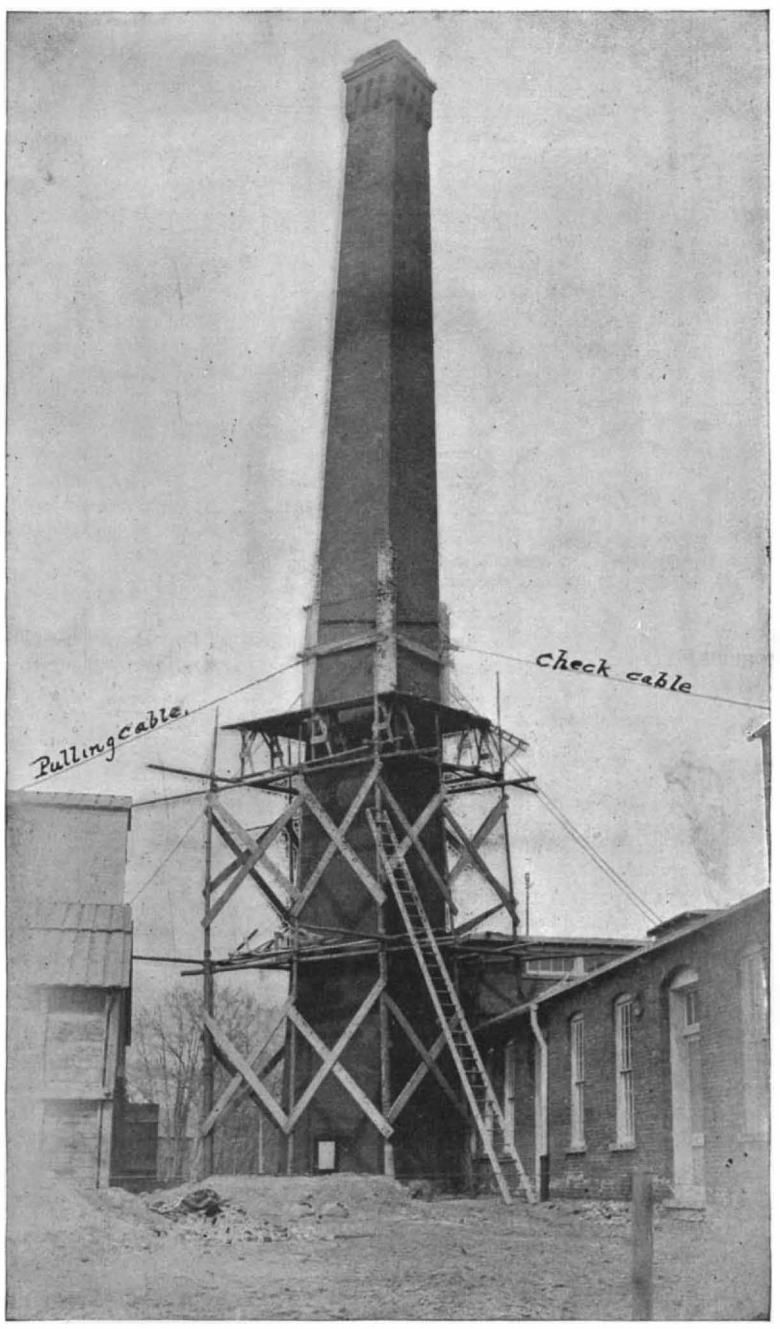
The earth was then excavated on the high side of the foundation nearly half way around to the bottom of the foundation (a depth of thirteen feet) and the main cable put under strain with the pulleys. By this means, in the course of three weeks, the chimney was brought back about four inches. Then, with a post hole digger eight inches in diameter, eleven holes were sunk vertically in the bottom of the trench around the foundation, principally at the highest point, to a depth of five and one-half to six feet. At this time the water in the river stood up to within one and one-half feet of the bottom of the foundation, the ground being soft to a depth of four feet; it then became very hard, showing that the strata supporting the chimney had been reached. No movement or flow of the soil was discovered until the eighth hole was sunk four and one-half feet and the tool withdrawn for clearance, when it could only be reinserted readily about three feet and headway made very slowly. From this removal of the earth there resulted within a few hours a righting of the chimney to the extent of five inches. This increased to eight inches by the next morning. The slack of the pulling rope was taken up as fast as the chimney moved, and the rope was kept under strain. By tightening up the pulley rope two or three times daily, in a week the chimney was brought back to eight and three-quarters inches.

At this point, in similar manner, the post hole diggers being reduced to six inches in diameter, about one-fifth as much more material was removed, immediately followed by righting the chimney to four inches, and from that point, after filling the holes with fine broken stone and gravel thoroughly rammed, by continued daily strain on the main cable the chimney was brought back to plumb at the rate of a quarter of an inch per day. The turnbuckles in the side cables were occasionally used to control any tendency toward lateral inclination.

The work has been accomplished without injury to the structure.

Below is given the record of observations of the movement of the chimney from the first discovery of its extensive settlement until brought back plumb. The figures under AB represent the distance out of plumb at the bottom of the brickwork in a direction parallel with two sides of the base. Those under BC give the distance out of plumb on a line at right angles to the first through the center of the chimney.

In September, 1894, the chimney leaned about two inches toward the river. This inclination came after the trench was filled; it probably results from the weight—eighty tons—of the filling material.



STRAIGHTENING A LEANING CHIMNEY ONE HUNDRED FEET HIGH.

MEASUREMENTS.

Date, 1893.	AB.	BC.
Nov. 6	16	.....
Nov. 8, 8 A. M.	20	.....
Nov. 8, 2 P. M.	22	4
Nov. 9	22·5	4·25
Dec. 5	24·25	5·5
1894.		
Jan. 5	26	6·5
Feb. 1	27·375	6·875
Feb. 27	27·875	6·9375
Mar. 17	28·125	6·75
Mar. 23	27·25	6·75
April 5	24·875	6·375
April 9	24·5	5·8125
April 10, 10 A. M.	22·3125	5·75
April 10, 1 P. M.	19·375	5·4375
April 19	16·125	4·75
April 20	13·6775	4
April 21	11·75	.....
April 22	10·25	2·625
April 23	9·875	2·4375
April 24	9·1875	2·4375
April 25, 7 A. M.	8·75	2
April 25, 11:30 A. M	5·625	0·875
April 25, 1 P. M.	4·4375	0·875
April 25, 1:40 P. M.	4·625	0·375
April 26	2·625	0·25
April 27	2·125	0·25
April 28	1·4375	0·0625
April 29	1·125	0·0625
April 30	0·875	.....
May 1	0·625	0·125
May 2	0·5	.....
May 3	0·125	0·1875
May 4	0·0625	0·0625

*Abstract of a paper by Joseph C. Platt, published in vol. xvi of the Transactions of the American Society of Mechanical Engineers.

Some Work of the Glass Institute at Jena.

At a recent meeting of a scientific club at Hamburg, a number of statements were made regarding the work of Dr. Schott's experimental glass institute at Jena. This institute is under the patronage of the Prussian government, and its purpose is the carrying out of scientific and practical experiments in glass. That it has been fully successful in both is certain. The reputation of the optical and chemical glass made here, and the value of the additions which Dr. Schott and his associates have made to the literature of glass, give this institute a unique position in the scientific and the commercial world. The success of the glass made here, says the Pottery Gazette, is to be attributed first to the fact that the number of the elements which may enter into glass as its principal constituents was greatly increased. It was found to be possible to introduce boric and phosphoric acids in place of silica in amounts up to 70·5 per cent, and to make good, durable glass, although the introduction of new bases was also necessary in using these acids. In place of the five elements used for so long a time, the experiments have led to the use of no less than twenty-eight which can be contained in glass in quantities up to 10 per cent at least. The experiments have been made almost entirely with optical and chemical glass, the endeavors being to find the very best glass for the purpose desired and at the same time to establish the connection between its properties and its composition. Samples of glass made in Jena have been tested by a number of eminent scientists to ascertain the coefficient of expansion. The extremes of the cubical coefficient of expansion have been thus found to be 0·00001097–0·00003369. Dr. Schott has, however, made glass with an infinitesimally small coefficient, and on the other hand, glass whose coefficient is about that of wrought iron. Up to this time the linear coefficient had been put at 0·00000883. It has also been shown that there is a relation between the coefficient of expansion and the kind of materials in the glass, though the proportions of the same do not always exert a great influence. A large percentage of borax in the glass greatly lowers the coefficient of expansion. The great difference in the coefficients of various kinds of glass has been used by Dr. Schott to good advantage in the manufacture of his chemical glass and gages, and also for thermometers. The glass tubes for the latter purposes are made of two layers of glass, one outside of the other, and these layers are of glass having different coefficients of expansion, that having the smaller coefficient being on the outside. There is a tension, then, away from the point where the two layers join, and if the glass be suddenly heated, it will be far less liable to burst than a tube made of ordinary glass. For the manufacture of gages a similar glass is used, only in this case the glass having the smaller coefficient is placed on the inside and that having the greater on the outside, as the force to be counteracted in this case is not heat, but pressure. In addition, the glass used for the inside of such tubes must be of a composition that will resist water and steam under pressure and at comparatively high temperatures. These gages are used in the German navy.

The resistance of the Jena glass to sudden changes of temperature is no less noteworthy. It may be heated to a temperature of 300°–400° Fahrenheit and then plunged into cold water without cracking.

Another specialty of the Jena Institute has been thermometer glass. After laborious experiments, Dr. Schott brought out a glass that is the most satisfactory for this purpose of any yet made; especially with regard to giving a thermometer with a zero point that does not change. His boro-silicate glass, the latest he has brought out, is about the ideal of thermometer glass.

Other ware, principally for chemical use, is made in large quantities here, such as combustion tubes, beakers, and bottles of highest standard of quality.

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Business and Personal.

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RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY ENGINE.—George E. Boom, New York City. This engine is designed to occupy but small space, and has rotary pistons and all rotary parts evenly balanced, reducing the vibratory motion to a minimum, and making it possible to employ a light base and framework while obtaining a high speed. The pistons are mounted on disks which have bearings in the walls of the cylinders, and on the opposite sides of the disks are segmental counterbalance weights to which are attached gear wheels, the disks, pistons and parts being mounted on two shafts parallel with each other. Self-oiling mechanism is provided for the bearings and the engine may be readily converted into a water pump or meter.

Railway Appliances.

CAR FENDER.—John P. Geraghty, Jersey City, N. J. Upon a main frame supported from the car, according to this improvement, is a yieldingly mounted sliding frame on which are pivoted side arms, an apron being attached at its lower end to the arms and at its upper end to a fixed support. The apron is thus normally held in a stretched position, inclined from the dashboard nearly to the rails, but when a person in the path of the car is struck by the fender and falls upon the apron the arms swing upward and form a scoop of the apron, in which the person will be received and held without injury.

SPEED INDICATOR.—George S. Wright and Howell P. Terry, Brooklyn, N. Y. A wheel on the axle or other rotary part of the car or vehicle, according to this invention, is connected by a driving belt with a shaft driving an axle on which is a wheel within a casing, a wing subjected to the current generated moving a pointer on a dial. The graduations on the dial indicate miles and parts of miles, and the position of the pointer indicates the speed at which the car is traveling.

SWITCH.—William G. Lewi, Albany, N. Y. This improvement is for a device to be operated from a moving car to shift switches. It comprises depressible platforms in front of a switch, parallel rock shafts, a plunger beneath each platform, while the platform comprises two drop sections and a sliding section, all having a hinged connection. There is a crank connection between each plunger and a rock shaft, while a shifting bar is connected with the movable section of the switch, and by links and crank arms with the rock shafts. The shifting bar may be automatically operated by pressing downward upon shifting plates at either side of the track.

SIGNALING APPARATUS.—Charles Oleson and John D. Morrison, Roseburg, Oregon. This is an apparatus arranged in connection with air brakes, the closing of an angle cock in the system being marked by an indicator in each car, and causing the locomotive whistle to be sounded. The signal pipe is charged with a constant pressure below that of the train pipe, and the signal pipe is connected with the angle cock, and when the plug in the latter is closed, connection is made with the signal pipe and a pop valve to sound the whistle in the cab of the locomotive.

Electrical.

TRANSMITTING ELECTRICAL ENERGY.—Thomas W. Onderdonk, New York City. A device more especially designed for use in dental work, rock drilling, etc., has been devised by this inventor, to facilitate transmitting electrical energy in a simple and effective manner. The invention comprises a reciprocating tool and an electro-magnet and armature for causing reciprocations in one direction, a motor in an electric circuit and on the motor shaft a thimble of alternating metallic and insulated strips, while a second electric circuit is connected with the first circuit and with the magnet of the tool. Contact plates in the second circuit engage with the thimble to transmit an intermittent current to the tool magnet, there being a rheostat in the second circuit to regulate the force of the reciprocations of the tool.

Agricultural.

TURNING SWATHS.—George E. Nelson, Dillon, Montana. This is a machine adapted to travel behind a mowing machine, and take up and turn over swaths of cut hay or grass, leaving the swaths in practically the same position relative to each other that they were before being lifted and turned. The frame of the machine is readily raised or lowered, according to the character of the hay or grass on the ground, and within the frame are two rotating rakes, each adapted to take up a swath.

IRRIGATION SHOVEL.—John H. Gordon, South Bend, Wyoming. This is an implement peculiarly adapted to the requirements of irrigation farmers, making it possible to do a variety of work with one tool. It has a protruding tip and chisel-like point, which may serve as a pick or a crowbar in digging a narrow, deep trench, and edges of the blade curving from this point outwardly and upwardly, so they will follow the tip through strong sod and into any soil, while the scoop shape of the blade enables it to remove large quantities of earth at every stroke.

Miscellaneous.

GEOGRAPHICAL CLOCK DIAL.—David W. Thompson, Englewood, Ill. This is a clock for the use of educational institutions, indicating to the eye, in addition to the local time of the place, the time of day or night in all parts of the world, the portion of the earth's surface where daylight prevails and the portion where night prevails. It is also capable of adjustment to illustrate this for all seasons of the year and all latitudes, showing the rising and setting of the sun and the seasons, and all terrestrial phenomena dependent upon the inclination of the earth's axis to the ecliptic and the revolution of the earth.

BUILDER'S SCAFFOLD.—John E. Ennis, Duluth, Minn. This invention provides scaffold supporting devices so arranged that the scaffold may be raised or lowered with the load by the operator thereon, the apparatus being capable of use as an inside or outside scaffold, or as a window scaffold where a ground support cannot be conveniently employed. The apparatus is also provided with a "runway" or intermediate scaffold, for use as a landing or turning station for the barrowman or load carrier.

TYPEWRITER WORD REGISTER.—Clayton O. Blandin, Hastings, Neb. This improvement is more especially designed for use in commercial telegraphy, registering the number of words written to determine the cost of a message, as such messages are usually written on a typewriter. It comprises a casing in which is a registering disk operated by connection with the space bar of the machine, and the improvement is applicable to every style of typewriter.

PYROCATECHIN MONO-ACETIC ACID.—Wilhelm Majert, Falkenberg, Germany. Pyrocatechin mono-actetate of sodium is a remedy for consumption and loss of appetite, stopping night perspiration reducing the evening temperature, and in mild cases destroying the bacilli of the disease. The acid is obtained, according to this invention, by subjecting one molecule of chloracetic acid to the action of one molecule of pyrocatechin in the presence of free carbonate of a free alkali or carbonate of alkali, in accordance with a novel process described in the patent.

STEAM RADIATOR.—Augustus Eichhorn, Orange, N. J. This inventor has devised a radiator designed to readily and effectively expel the air from its interior upon the entry of the steam. In the base is a series of sections communicating with the base at one of their ends, while a diaphragm extends longitudinally and centrally with the base and serves to introduce the steam at the rear of the sections, so that it will be behind the air, and thus easily and effectively expel it.

STORM SASH FASTENER.—Andrew A. Loetscher, Dubuque, Iowa. For fastening storm windows, screens, or shutters to a window casing, this inventor has devised a simple and inexpensive fastening comprising a flanged block to be pivotally connected to a sash, a handle in line with an opening in the flange, while a pin or lug is attached to the casing for engagement with the flange. The device may be easily operated from the inner side of a room, so that a screen may be placed in position or removed with very little trouble.

FENCE POST.—William J. Sleep, Birmingham, Ala. This is a post especially adapted for carrying the runners of wire fences, and adaptable for the uprights of an arbor, a summer house, etc. It is preferably of metal, of boxlike construction, with longitudinal slots or openings and drainage openings near the ground line, and has undercut downwardly inclined brackets to receive the upper ends of braces. A binding strip held on one of the faces of the post has transverse grooves for securing wires to the post.

FENCE.—Elias Roth, New Oxford, Pa. This invention is for an improvement in fences made with wire stretchers, the stretcher wires being made with integral loops to engage the side of the post and being secured on the posts by staples which embrace adjacent members of each loop, thereby preventing longitudinal movement of the wires. The pickets are of peculiar construction, and are firmly bound by the stretcher wires, the latter yielding upwardly when shortened by low temperatures and sagging proportionately during the hot, summer weather, while the fence remains erect.

TILTING SPRING SEAT.—Charles F. Davy, Starkville, N. Y. This is a seat supported on springs from a frame adapted to be bolted to the seat post of a vehicle, and having at its sides studs from which extend side springs, so that the seat will be free to move in all directions, but will be held in position by the springs. The seat is well adapted for use on agricultural machines, locomotives, etc., being readily adjustable to stand at an angle to the surface over which the machine is driven.

CORSET.—Levi Weingarten, New York City, and David Grotta, Newark, N. J. This corset has a slit in one edge and a pocket in each edge of the slit, a shield being permanently secured to the corset adjacent to the inner end of the slit, with its side edges sliding freely in the pockets. The corset may be made to readily adapt itself to the form of the user, the expansible parts being capable of spreading or contracting without exposing portions of the garments beneath the corsets.

Designs.

DESIGN FOR MIRROR FRAME.—Albert Wanner, Jr., Hoboken, N. J. This design comprises a scrolled frame or border, latticework within the frame and a floriate center within the latticework, the sides of the frame having two series of ornaments.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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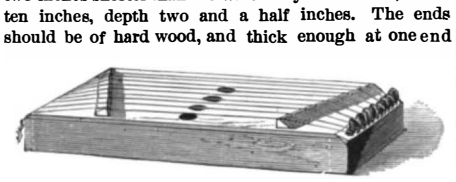
(6830) W. W. M. writes: In your answer to my question in a recent issue, you advised me to use caustic soda in place of caustic potash in the battery under consideration. If such a change were made, 1, what would be the change in potential? A. There is no appreciable change in voltage, but you get the advantage of a clean solution and of one cheaply made. 2. Could commercial sheet zinc be used for negative plates? A. Yes.

(6831) J. P. H. asks how to make an Æolian harp. A. Æolian harps should be made to fit into a window, so that the sash can be adjusted to cause a strong breeze across the strings of the instrument. Make the box of thin dry pine, the top piece or sounding board of extra clear stuff about three-sixteenths of an inch thick. Sides and bottom can be one-quarter of an inch, length two inches shorter than the width of your window, width ten inches, depth two and a half inches. The ends should be of hard wood, and thick enough at one end



to hold the eyes or studs for fastening the wires or catgut strings. At the other end the wood should be thick enough to hold a set of violin keys, if you use catgut; or iron piano pins, if you use wire, which should be steel. Two bridges of hard wood glued diagonally across each end, for the strings to rest upon. If steel wire is used, a round wire should be inserted upon each bridge, so that the sounding wires will not cut the wood. The rest you may gather from the sketch. The tuning should be harmonic, or say thirds, fifths, and octaves. Make about four holes in sound board, one inch diameter, under the strings.

(6832) S. L. D. says: I am a subscriber to your valuable paper, and would like you to tell me in Notes and Queries how I can restore gilt picture frames that have become dark and dingy. A. You may improve them by simply washing them with a small sponge moistened with alcohol or oil of turpentine, the sponge only to be sufficiently wet to take off the dirt and fly marks. They should not be wiped afterward, but left to dry of themselves.

(6833) W. P. W. asks: What will take electricity out of printing paper? A. Nothing has yet been invented that will do this satisfactorily. Moist air palliates the evil, but will not always stop it.

(6834) J. S. asks: 1. How is copper oxide easily and cheaply made? I have tried heating copper scraps, but it don't work after the first coat. A. Mix with ten per cent of potassium chlorate and water enough to make a thin paste, ignite, and wash. By calcining and vigorous shaking you should succeed by simple ignition. 2. How are the copper oxide plates in an Edison-Lalande battery made? A. See SUPPLEMENT, No. 792 for description of the battery named. 3. I am making a dry battery as follows: I use an amalgamated commercial zinc cup, coated with plaster of Paris and sal-ammoniac mixed with water containing a small quantity of gelatine and glycerine. Inside of this is a layer of blotting paper, and around the carbon a mixture of powdered carbon and manganese dioxide mixed with the same solution as the plaster of Paris. The voltage is all right, but the amperage is low. How can I reduce the internal resistance? A. The resistance will inevitably be high—you can reduce by adding zinc sulphate in strong solution.

(6835) A. R. B. writes: We should like to be informed, through your valuable paper, how many storage batteries it would require to light ten 16 candle power, 32 volt lamps for six hours continuously per day. What primary battery and how many would you advise us to get, with which to charge the storage batteries? A. We advise you to consult with a dealer in storage batteries, as different sizes are made. You will require eighteen in series, and a moderate size of cell would suffice in a single series for your purposes, giving a total of eighteen cells. Do not attempt to charge with a primary battery.

(6836) J. W. C. asks: Can you give me a receipt for making a solution for removing the scale from drop forgings of iron and soft steel? I understand there are some concerns using a pickle for doing so. What effect would it have on the metal? A. Use, by volume, sulphuric acid, 1 part; 1 part nitric acid; 2 parts water, applied warm. Either the acid or the iron may be heated. It will not injure the iron, unless used to excess.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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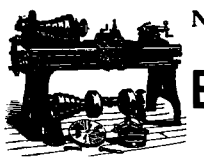

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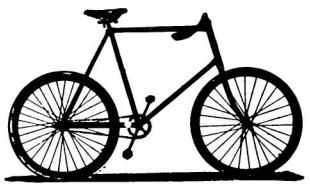

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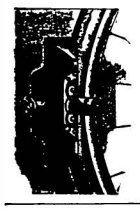

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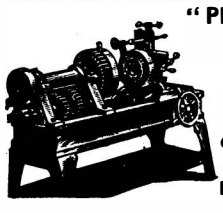

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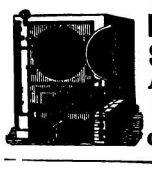

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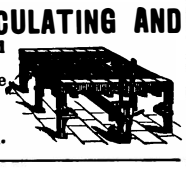

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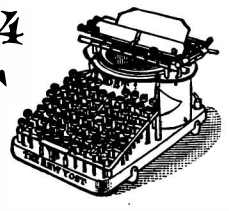

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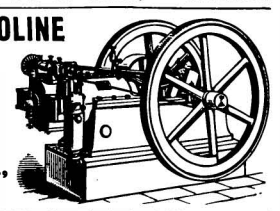

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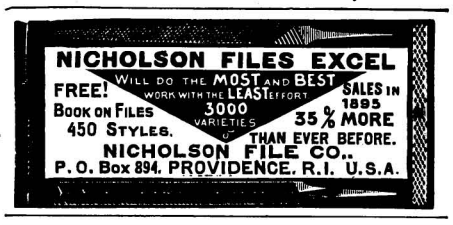
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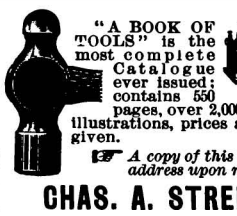

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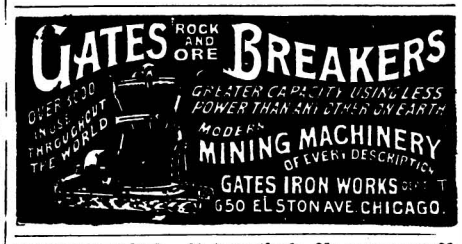
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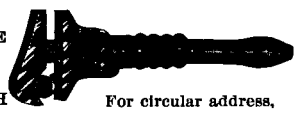

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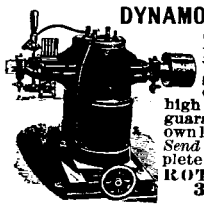

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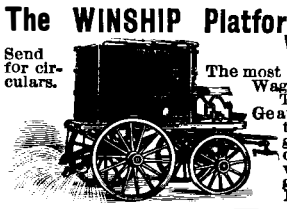

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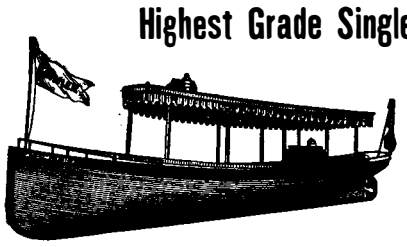

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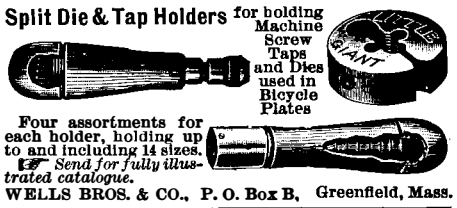

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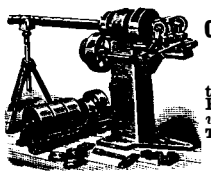

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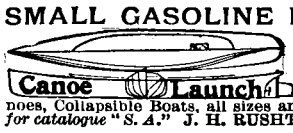

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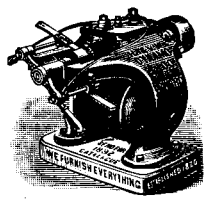

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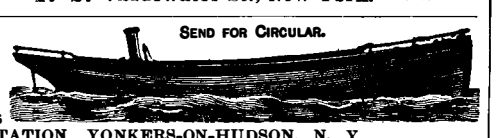

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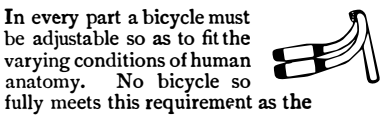

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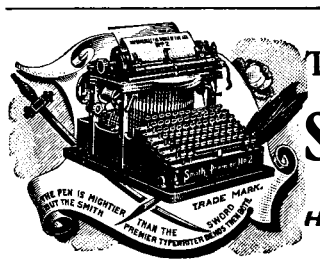

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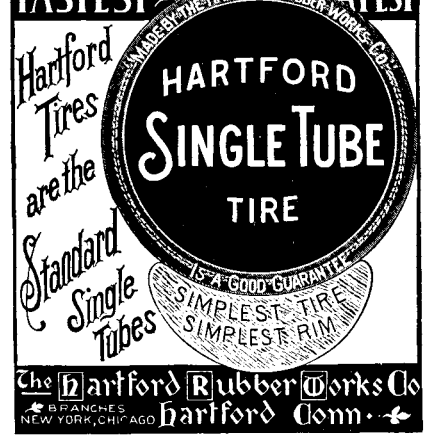

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